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FOURTEENTH REPORT

(FIRST BIENNIAL)

OF THE

STATE BOARD OF HEALTH

OF THE

STATE OF NEW HAMPSHIRE

FROM

JULY 1, 1895, TO NOVEMBER 1, 1896.

CONCORD:
EDWARD N. PEARSON, PUBLIC PRINTER.
1897.

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STATE OF NEW HAMPSHIRE.

OFFICE OF THE STATE BOARD OF HEALTH,
STATE HOUSE, Nov. 1, 1896.

To His Excellency the Governor and the Honorable Council:

I have the honor to present herewith the Fourteenth Report of the State Board of Health.

Respectfully submitted:

Irving A. Watson
Secretary.

97417

MEMBERS OF THE BOARD.

GOVERNOR CHARLES A. BUSIEL . . .	Laconia.
ATT'Y GEN. E. G. EASTMAN	Exeter.
G. P. CONN, M. D., *President*	Concord.
C. S. COLLINS, M. D., ...	Nashua.
ROBERT FLETCHER, C. E.	Hanover.
IRVING A. WATSON, M. D., *Secretary* . .	Concord.

REPORT.

Herewith is presented the fourteenth report of the state board of health, the same being the first biennial report, under the act of the legislature of 1895. The thirteenth annual report of the board embraced the fiscal year of 1894 and to July of the year 1895, therefore the present report, as a matter of fact, covers a little less than a year and a half. The board still adheres to its former belief that its reports should include material which will be largely educational in character, rather than to encumber its pages with a large amount of what might be termed technical knowledge of data relating to certain specific phases of public sanitation. In other words, we reiterate the sentiments which have been formerly expressed in the reports,that greater results are accomplished in the direction of public sanitation, in a state like New Hampshire, by educating the people in matters which are vitally connected with hygiene and sanitation, than by exhibiting strictly scientific and technical investigations, which would not be interesting to or even studied by the average citizen. To this end the matter included in our annual reports is intended to be largely of a popular character, so that it may be read and understood by any citizen who desires to inform himself in matters pertaining to sanitary work. An exception to this statement may perhaps be taken with reference to the statistics relating to births, marriages, divorces and deaths. These facts, however, are of vital importance in noting the movement of the population, and especially in calculations upon the causes which effect the mortality rates of localities.

SANITARY PROGRESS.

It must be evident to any one who has studied the sanitary situation of the state for the past decade, that there has been

a great advance in matters relating to public hygiene. Evidence of it is seen in almost every direction, and particularly with respect to public water-supplies, sewering of towns and cities, and the control of infectious and contagious diseases. It is only a few years since practically no attempt was made to restrict some of the communicable diseases which are now in some towns and cities so efficiently and promptly handled. There has also been an increase in the knowledge of general sanitation among the people, which has resulted in closer attention to the many conditions which affect more or less the health of the individual.

EPIDEMICS.

During the period covered by this report there have been no serious epidemics in the state. In some cases the conditions became somewhat alarming on account of an outbreak of diphtheria or scarlet fever, but in nearly every instance the disease was suppressed without any approach to a wide-spread epidemic. The difficulty in promptly eradicating a contagious disease is due many times to its prevalence in a mild form, perhaps not recognized by the family, or, if so, not considered of sufficient importance to require the attendance of a physician. These mild cases are, in one sense, the most dangerous that can appear in a community, because they are fruitful sources for the spread of the disease. In almost every instance where the oubreak was of sufficient malignity to call for the prompt attendance of a physician and a correspondingly prompt notification of the health officer, the disease has been easily and readily controlled.

The state board of health has unlimited authority under the law to assume control of quarantine when a disease becomes epidemic. The only occasion it has had in the last few years to exercise that authority was in the outbreak of small-pox in Sullivan county in 1895, an account of which was published in the last report of this board. However, the state board lends its aid to local boards of health as far as possible without assuming executive control, whenever its assistance is desired,

and to that end furnishes directions for the sanitary management of contagious and infectious diseases, together with placards for infected houses, blank forms of notification, etc., for the local boards. Pamphlets upon the restriction and prevention of diphtheria, scarlet fever and typhoid fever are furnished gratuitously to the local boards of health or to any citizen in the state, upon application.

TUBERCULOSIS.

Health authorities are giving attention to the restriction and prevention of tuberculosis, the most fatal disease known to mankind. In our own state it heads the list of mortality, as it has done in years past as far as our records extend, with the single exception of 1892. Investigations which do not admit of dispute, prove that tuberculosis is a communicable disease, and our most advanced sanitary authorities are giving this matter considerable attention. Indeed, it is not improbable that it will within a comparatively short time be classed in the "notification" list, in order that afflicted families may be fully informed as to the best means to prevent the disease. In some of the former reports of this board we have given considerable space to the subject of tuberculosis, with special papers upon its cause and prevention, so that we believe the people of New Hampshire are generally well informed in regard to its nature, and understand some of the essential points in its restriction. Indeed this is probably true of the entire country, and the increased knowledge which the people have obtained in this direction is already, it is believed, leading to a gradual diminution in its mortality. Reports from the several states show that the death rate from consumption is slowly decreasing, a result brought about, doubtless, through a better understanding of the nature of the disease and by the measures taken to control and stamp out bovine tuberculosis.

BOARDS OF HEALTH.

We have much to say in praise of many of the local boards of health in the state. There are some boards which are com-

posed of able, intelligent and efficient officers, and who have done and are doing a great work in their respective communities. Upon the whole, the work done by the local boards of health is very great and has accomplished very marked results, throughout the state. There are, however, on the other hand, some totally incompetent boards, and this condition results, not from a lack of qualified men in the given locality, but through the law which admits of three different methods of creating a local board of health: First, the town may elect a board at its annual meeting; second, the board of selectmen may serve as a board of health if the town fails to elect; third, the selectmen may appoint a local board of health if one is not elected and they themselves decline to serve as such. It is to be regretted that such appointment is not always made, as better sanitary work would be accomplished in our judgment, basing the opinion upon the observations of the past twelve years. A health officer should be selected because of his special fitness for the position, which is not always the case when he is elected at the annual meeting. Likewise the board of selectmen are not elected because of their qualifications for the office of health officers, but rather to perform other duties required under the law in the management of the general affairs of the town; hence it follows that a board of selectmen, although able and competent as such, may be wholly unsuited for the position of health officers. At the last session of the legislature the committee on public health reported a bill, which was passed by the House but lost in the Senate, which provided that every town should have a board of health, composed of three men who should be appointed so that the term of one would expire annually, and the members afterward appointed should hold office for three years. Special attention was to be given to the fitness of the men for the office, and the plan would ensure a constant board of experienced men, and naturally a greater degree of efficiency would be attained than is possible under the present system. We believe this matter to be of great importance in local health work, and we would urge upon the legislature the enactment of a measure of this kind.

PUBLIC WATER-SUPPLIES.

The water-supply of a town or city, from a sanitary standpoint, is second to none other, consequently this fact has been very thoroughly impressed upon the people of New Hampshire, and as a result most of our towns are now supplied with water from sources of undoubted purity. The great danger arising from the use of water from surface wells, has probably been demonstrated in every town in the state, and the remarkable results following the introduction of a pure water-supply, in stamping out the annual attacks of typhoid fever, have been witnessed in more than one town. We have taken measures to ascertain some facts relating to many of our public water-supplies, and present the same elsewhere in this report. The information is given in detail, not only as a matter of sanitary record, but also for the purpose of exhibiting to other towns what has been done elsewhere and perhaps under conditions similar to their own.

NEW HAMPSHIRE ASSOCIATION OF BOARDS OF HEALTH.

Perhaps not the least advancement made during the year, in the direction of public health movements, was the organization effected under the above title. The value of association and organization in any given branch of labor is evident to all, and therefore it was deemed best to bring together in one body, as far as possible, the health officers of the state, for the purpose of comparing notes and establishing a general school for sanitary instruction. The attempt proved most successful. The first meeting was held for organization in October 1896, at which time some fifty health officers were present. Papers were read upon several important sanitary subjects, and discussions followed. The work of this day's meeting has been given a place in this report.

VITAL STATISTICS.

A summary of the vital statistics of the state is presented in this report. Vital statistics constitute the basis of all calcula-

tions in sanitary work. Upon such statistics public hygiene depends for its future progress. From no point of view can sanitation be studied accurately unless the facts are based upon the vital statistics of that community. They constitute a guide board, pointing out the delinquencies as well as the requirements of a locality. An eminent authority states that "Vital statistics furnish unerring lessons as to the health, prosperity and morals of the people. They teach the influence of marriage on illegitimacy and morality; the fecundity of the whole people and of the different races thereof; the vital force of the children; the duration of life, and its expectation and value for all ages and races; the influence of climate, occupation and locality in generating disease and improving health. They suggest the removal of conditions unfavorable to health and life, and give warning of the approach of morbific storms, by ignorance of which cities and even nations have been destroyed. They furnish the only foundation of life insurance, and serve as guides to the resident and immigrant, the capitalist and the laborer, the politician and the statesman, the moralist and the scientist. Ignored by the average American legislator, their practical utility has been recognized and vindicated by Napoleon and Thiers, by Bismarck and Cavour, by Gladstone and by Disraeli, and their establishment has become a test of the degree of civilization by a people and rulers."

Those desiring to study the subject of vital statistics in detail or to determine specific facts in relation to births, marriages, divorces and deaths, are referred to the Registration Report, the data given in this report being only a brief summary of the same.

THE BOARD OF CATTLE COMMISSIONERS.

The work of the State Board of Cattle Commissioners may be said to be, primarily, in the interests of public health. Its work has been chiefly confined to the investigation of tuberculosis among cattle, under the provisions of the law, and the destruction of such animals as have been found to be afflicted with this disease. Elsewhere will be found the report of the

board for the years 1895 and 1896. We believe that the suggestions embodied therein, especially those relating to the sanitary condition of cattle sheds, stables, barns, etc., to be of great importance to the farmers and stock raisers of the state, independently of the intimate relations they bear to tuberculosis itself. These suggestions should receive the attention of all dairymen in particular. The matter of a clean milk supply is of very great importance to the public health interests of the state.

CHARITABLE AND PENAL INSTITUTIONS.

From year to year there has been a steady improvement in the sanitary condition of nearly all our eleemosynary institutions, so that today they are much in advance of the condition which existed a decade ago. One of the greatest improvements in this direction was the abandonment of the old wooden buildings that constituted the Hillsborough county farm at Wilton, and the construction of a set of fine brick buildings on a new site in Goffstown, Grasmere station, a short distance from Manchester. It was fortunate that this long needed improvement was made before any serious calamity by fire occurred, as was at all times imminent at the former institution.

In the other counties improvements to a greater or less extent have been made, the remodeling of the plumbing and drainage at the Rockingham county jail, at Exeter, deserving special mention, a description of which will be found in another place in this report.

COMMISSIONERS OF LUNACY.

The state board of health is also the board of commissioners of lunacy, which has authority under the law to commit certain indigent insane persons to the New Hampshire Asylum for the Insane for remedial treatment, and in a general way has supervision over all the institutions in the state at which insane persons are confined. The operation of that part of the law which provides for remedial treatment for indigent insane

persons has resulted in a vast amount of good to that afflicted class. It provides treatment for those who, under the provisions of the former law, would have been consigned to the county almshouse without any remedial treatment whatever. For a complete account of the work of the board reference is made to the Report of the Board of Commissioners of Lunacy. We may state, however, that of the number committed to the New Hampshire Asylum for the Insane during the year 1896 and also discharged therefrom, including those previously committed but discharged during the year, there were dismissed as recovered 21.89 per cent; improved, 15.98 per cent. This is certainly a most satisfactory showing. Appended is a statement of the number of patients at the several institutions in the state, with commitments, discharges and deaths at each, for the year 1896:

The following shows the number of commitments, discharges, and deaths at the institutions named, during the year ending September 30, 1896, also the number of inmates remaining of these institutions at the latter date, as shown by the records of the board:

	Inmates Oct. 1, 1896.	Commitments during the year ending Sept. 30, 1896.	Discharged.	Deaths.
New Hampshire Asylum for the Insane	424	181	131	40
Rockingham County Asylum	59	9	3	6
Strafford County Asylum	.....	.....	.....	.....
Belknap County Almshouse	6	1	2	1
Carroll County Asylum	14	.....	.....	.....
Merrimack County Asylum	50	9	1	4
Hillsborough County Asylum	93	13	5	4
Cheshire County Asylum	32	3	.....	5
Sullivan County Asylum	7	3	2	3
Grafton County Asylum	22	5	1	3
Coös County Asylum	18	2	2	.....
Total for state	725	226	147	66

ROCKINGHAM COUNTY JAIL.

The following communication, with reference to this institution, sent to the county commissioners, is self-explanatory:

OFFICE OF THE STATE BOARD OF HEALTH,
CONCORD, April 29, 1896.

Board of County Commissioners, Rockingham County, N. H.:

Gentlemen:—

On Monday, April 27, I visited the county jail at Exeter, and made an inspection of the institution with reference to the existing system of plumbing and drainage, and the proposed extension of the sewer.

In regard to the plumbing, I am obliged to report that the whole system has not a single sanitary quality and is to be condemned in toto. In fact I do not hesitate to say that the sanitary condition of the jail is the worst that I have ever found in any public institution in the state. There is not a single sanitary principle in connection with the piping or plumbing of this institution, and the condition is not only disgusting in the extreme, but is at all times a menace to the health of the prisoners, as well as to all other inmates of the buildings. The stench from these pipes is at all times noticeable in the cells, (so I was told by the prisoners), and certainly it was extremely offensive at the time of my visit. I have never before seen any attempt to construct closets without some arrangement for flushing the same. In the jail the only water available for flushing the closets is taken from one faucet and carried in a bucket.

Without going further into the discussion of this faulty and dangerous system of plumbing, I would say that in my judgment it is the duty of the county commissioners to put in a modern system of plumbing at once. The present fixtures and piping within the building are totally worthless and should be wholly removed. Smaller pipes with modern closets should take their place. The water supply should be increased so as to furnish at all times an ample amount of water for the institution.

I must urge upon your board the necessity for immediate attention to the sanitary condition of the jail. There is nothing that will justify delay in this matter. If no appropriation is available to carry out the changes and work herein suggested, I believe you would be justified in hiring the money

and trusting to the county delegation at its next meeting to make an appropriation ample to cover the expense. There is no doubt whatever but that the convention would make the necessary appropriation.

For the State Board of Health,

(Signed) IRVING A. WATSON,

Secretary.

With creditable promptness the county commissioners remodeled, or rather put in a complete new system of plumbing and drainage for the jail. A close inspection of the work shows that it was thoroughly well carried out, the material and the plumbing being of first-class quality. The eight cells of the jail are each supplied with a water-closet, with an abundance of water for flushing purposes; also a faucet from which the prisoners can at any time obtain good drinking water. All the pipes are of iron, and the traps are ventilated, to prevent any possible siphonage. Surface ventilation from all the closets is connected with a chimney, so that ventilation is assured at all times. Bath-rooms ample for the requirements of the jail have been provided. Hot and cold water are at all times available, the former being furnished by an apparatus connected with the kitchen range.

New piping and fixtures were supplied to the main house. Stand-pipes are provided, so that in case of fire a supply of water is at hand. The spring which heretofore furnished an inadequate supply of water, has been abandoned and connection made with the town supply, which is ample at all times. It may be said, without particularizing further, that the sanitary condition of the jail and main house is now excellent in every respect. The sewerage system has been greatly improved. A new sewer was laid, and two settling tanks constructed some distance from the buildings, the overflow from which enters a brook in the valley below the premises.

We desire to acknowledge our appreciation of the action of the county commissioners in carrying out so promptly and efficiently the much needed improvements.

REPORT UPON SOME OF THE WATER-SUPPLIES OF NEW HAMPSHIRE.

The state board of health has given considerable attention to the subject of public and private water-supplies during its brief existence, because it is well known that the subject is vitally associated with the health of the people. The danger from surface wells, unprotected from the drainage and sewage of inhabited localities, has been recognized as a prolific cause of illness, particularly of typhoid fever. This fact has been demonstrated to many of our towns and cities, and public water-supplies have, to a greater or less extent, been substituted for these dangerous wells. The matter is of great importance, and often affects the financial interests of the state, outside of our own citizens, since our summer visitors are solicitous upon this very point. In order to ascertain the extent to which public supplies have been provided, the following circular was sent out, and appended are the replies:

THE STATE OF NEW HAMPSHIRE.

OFFICE OF THE STATE BOARD OF HEALTH,

CONCORD, October 8, 1896.

BOARD OF HEALTH,

.....

NEW HAMPSHIRE.

GENTLEMEN: The State Board of Health is now making some investigations relating to the water-supplies of this state, and to that end we would respectfully ask your board to furnish us the desired information relating to your town or to the village or villages in it. If you do not possess the knowledge called for below, will you kindly get the proper person to fill out the blank, and then transmit it to this board? We would like to have a return made *at once* in order that we may incorporate such facts as we deem best in the next annual report of this board, which will soon go to press.

The subject is an exceedingly important one, and we trust that you will make every endeavor possible to furnish this board with exact facts relating to the water-supply of your locality.

Very truly yours,

Irving A. Watson

Secretary.

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1. Name of place, ...
2. Name of water-works, ...
3. Are the works owned and operated by the town or company? .....
4. From what source is supply obtained? .....
5. Where is source located? .....
6. Does the water flow directly from the source into the mains? .....
7. Is a stand-pipe or reservoir used for storage and head of water? ....
8. What is the relative location of source, storage, basin, and place supplied?.....

9. What power is used, steam or gravity? .....
10. What is the capacity of the storage basin (reservoir or stand-pipe) in gallons? .....
11. What is the daily capacity of the system? .....
12. What is the average daily consumption of water in winter? .....
13. What in summer? .....
14. Is the storage basin (reservoir or stand-pipe) covered or open? ....
15. Is the water filtered before it enters the mains, and if so, by what process? .....
16. What precautions, if any, are taken to keep the land about the source and the water-sheds free from polluting substances, such as manures, sewage, decaying animal and vegetable matter? ....
17. Are the surroundings naturally clean and free from contaminating influences? .....
18. How long has the system been in operation? .....
19. Has the general health been better since the works went into operation? .....
20. Cost of construction, ...
21. Probable number of families supplied by the system? .....
22. What proportion of the community takes water from this system?.
23. Does the system furnish an ample amount of water at all times? ..
24. Is the pressure sufficient for fire purposes? .....
25. Average number of pounds pressure per square inch, ...
26. Number of hydrants for fire purposes, ...
27. Do the public ever complain of the quality of the water furnished? If so, state particulars. .....
28. Has an analysis of the water ever been made? If so, can you furnish this Board with the results? .....
29. If your town or village has no public water-supply, is the construction of one contemplated? If so, state particulars, ...
30. General remarks. (Under this head, state anything of importance or interest relating to the water-supply of your town or city not included in the answers to the foregoing questions.)

The following reports were received in reply:

ALLENSTOWN.

Suncook village, in this town, is supplied with water by the Suncook Water-works company, from Bear Hill pond, on a mountain side about three miles from the village. The water flows into the mains from a reservoir covering about two acres. The pond is from two to three miles from the reservoir. The reservoir was thoroughly cleaned and the bottom covered with gravel. The system has been completed only about two months, at a cost of about $50,000. There is a pressure of from 80 to 100 pounds per square inch. Fifty hydrants are connected with the system. The water has been proven by analysis to be as pure as any in the state.

In addition to this system, there is another small supply.

AMHERST.

The water-supply of Amherst is from wells and from two aqueducts owned by private individuals.

ANDOVER.

The village is situated in the valley of the Blackwater river, Kearsarge and its foot-hills being on the south, and Ragged mountain on the north. The village is mainly on the north side of the river and gets its water-supply from the Ragged mountain shed. At the base of this mountain, is what is known as Mud pond, having an area of about one acre, and about one mile and a quarter from the village. This pond must be fed largely by springs, as aside from the inflow and overflow from melting snow and heavy rains, there is no special inlet and very little outlet. Along the water-shed, extending from this pond to the village, springs abound, from which nearly all the water-supply of this village is taken. Mr. Clarence E. Carr of Andover supplies about two thirds of the water used in the village. He has three reservoirs, comprising two systems. In one system

iron pipe is used almost exclusively, and in the other lead pipe is employed to the same extent. The first system is fed by springs which are connected with a reservoir holding from 500 to 600 hogsheads, from which it runs in a six- and a four-inch pipe to the village, where it is distributed. The other system is also fed by springs, connected with two reservoirs, holding about the same quantity of water as the first named. This supply is conducted to the village in two one-inch lead pipes, and is thence distributed. The supply pipes are equivalent to about two three-quarter inch pipes running continuously. The springs run, in some instances, from one to another, and in others directly into the reservoir. The lowest spring is perhaps 30 feet higher than the village, and the highest about 800 feet higher. Each family uses what it wishes for domestic purposes and in summer a good deal for sprinkling purposes. All the reservoirs are covered, the three main ones having houses over them. A part of the system has been in operation for 30 years or more, and a part for upwards of 20 years. There have never been any cases of lead poisoning, or anything to indicate any trouble in that direction, with this water-supply. About 25 families are supplied by this system; about eight have wells, and about the same number are supplied by springs from the same water-shed. There are only two hydrants in the village, connected with the iron pipe described, for fire purposes. The large reservoir is about 75 feet higher than the village, and about one third of a mile distant.

[ANALYSES FOR C. E. CARR, ANDOVER.]

Sanitary analysis of water from large reservoir, for C. E. Carr.

Color, yellowish; evaporation, quiet; residue, uniform but yellowish; ignition of residue, it changes color little; solids, grains per gallon, 3.7; loss on ignition, grains per gallon, 1.0; hardness, degrees, 2.5; alkalinity, degrees, 2.0; chlorine, grains per gallon, 0.2; free ammonia, part per million, 0.01; albuminoid ammonia, part per million, 0.05; nitric acid, trace; nitrous acid, none; lead, none; lime, strong trace; sediment,

it consists mostly of precipitated ferric hydrates. Microscopic examination: nothing important. Oxygen for oxidation, grains per gallon, .0067. This is good water.

(Signed) EDMUND R. ANGELL.

Derry, N. H., Aug. 30, 1892.

Sanitary analysis of water from the two reservoirs, for C. E. Carr.

Odorless; colorless; evaporation, quiet; residue, uniform and white; ignition of residue, it does not darken; total solids, grains per gallon, 2.8; loss on ignition, grains per gallon, 0.8; hardness, degrees, 0.87; alkalinity, degrees, 1.00; chlorine, grain per gallon, 0.1; free ammonia, part per million, 0.01; albuminoid ammonia, part per million, 0.045; nitric acid, none; nitrous acid, none; lead, grain per gallon, 0.014; iron, mere trace; sediment, some; microscopic examination, few bacteria, nothing important. This is good water. All the results of analysis are favorable. I think the amount of lead is not sufficient to be harmful. Of course, water which has remained in the pipe should be rejected, as it contains considerable of the metal.

(Signed) EDMUND R. ANGELL.

Derry, N. H., August 17, 1891.

(The water covered by the above analysis had been purposely left standing in the pipe all night and was the first drawn from it in the morning.)

Quantitative mineral analysis of the water from the two reservoirs, for C. E. Carr.

This water contains the following minerals: Carbonate of lime, sulphate of lime, sulphate of soda, chloride of soda, silica, free carbonic acid. The only substance in it which has medicinal properties is the sulphate of soda. There is but very little of this present. It gives the water a mild laxative effect. No harmful mineral is present.

(Signed) EDMUND R. ANGELL.

Derry, N. H., August 17, 1891.

ANTRIM.

The Antrim South Village fire precinct furnishes water to the town from Campbell's pond, situated in the north-east part of the town, three and a half miles distant. The pond

is fed by springs, and the water runs by gravity directly into the mains. The capacity of the storage basin is 25,000,000 gallons. The land around the pond is pasturage or wood land, and is naturally clean and free from contaminating influences. The system has been in operation upwards of three years. The cost of construction of the works was rising $23,000. There are 105 families supplied from this water system. The average pressure is 90 pounds to the square inch, and the supply is ample for fire purposes, there being 26 hydrants. An analysis of this water shows that it compares well with any in the state.

ASHLAND.

The water-supply is owned by the town, under the corporate name of the Ashland Water-works. The source is from Jackson pond through Jackson brook about one third of a mile to the reservoir, thence one mile and three fourths in main to the village, by gravity. The capacity of the reservoir is about 500,000 gallons. The reservoir is open, and the water is not filtered before it enters the main pipe. The cost of construction was $30,000, and the system has been in operation two years. The supply is ample for all purposes. The average pressure is 100 pounds per square inch. This water is supplied to 40 families, being about one fourth of the entire community, and there are 46 hydrants for fire purposes. Following is an analysis of the water, as made by Prof. E. R. Angell:

[*Sanitary analysis of water from Jackson Pond, Ashland, N. H.*]

Odorless; color, yellowish; evaporation, nearly quiet; residue, few circles and yellowish; ignition of residue, it blackens some; solids, grains per gallon, 1.6; loss on ignition, grains per gallon, 0.8; hardness, degrees, 0.8; alkalinity, degrees, 0.5; chlorine, grains per gallon, 0.05; free ammonia, part per million, 0.045; albuminoid ammonia, part per million, 0.06; nitric acid, no trace; nitrous acid, none; poisonous metals, none; iron, trace; sediment, very little; micro-

scopic examination; mineral particles, few; infusoria, rhizopods, vegetable cells; oxygen for oxidation, grain per gallon, 0.185. This is good water.

BATH.

Water for the town is supplied by the Bath Village Water Company, from a stream known as Simonds brook, one mile above the village, and with a fall of 260 feet. A storage well was constructed in this stream 12 feet deep and 12 feet in diameter, from the bottom of which a large spring is constantly boiling. The capacity of this well is about 6,000 gallons, but might be extended to five times that amount. The well is covered, and there is no opportunity for contamination from any source. This system was constructed about 18 years ago, at an outlay of $4,000, and supplies about one half of the families in town, 25. There is a pressure of 80 pounds to the square inch, and the supply is ample for fire purposes, but there are no hydrants.

BELMONT.

The water-supply is owned by the town, under the corporate name of the Belmont Aqueduct Company. The source is natural springs on a side-hill about three fourths of a mile from the village, where there is a reservoir of about 120,000 gallons' capacity. The daily capacity of the system is 14,000 gallons, while the daily average consumption is 10,000 gallons for the winter, and 12,000 gallons for the summer season. The reservoir is covered, but the water is not filtered before it enters the mains. The system cost $10,000, and has been in operation some three years; 50 families are supplied with the water. In August, 1894, the supply failed, and since that time water has been forced into the reservoir by steam pump at Gilmanton Mills, from a pond. The pressure is 76 pounds per square inch, and there are 20 hydrants for fire purposes. There has been some complaint against the water since the introduction of water from the Gilmanton pond. The water is conducted from the reservoir to

the village in wooden pipes, and then distributed to the consumers in galvanized pipes. Following is an analysis of the water, by Prof. E. R. Angell:

[*Sanitary analysis of water, W. H. H. Chaplain, Health Officer, Belmont, N. H.*]

Odorless; color, yellowish; evaporation, some foamy; residue, yellowish and some circles; ignition of residue, it darkens some; solids, grains per gallon, 3.1; loss on ignition, grains per gallon, 0.9; hardness, degrees, 1.0; alkalinity, degrees, 1.0; chlorine, grain per gallon, 0.05; free ammonia, part per million, trace; albuminoid ammonia, part per million, 0.092; nitric acid, trace; nitrous acid, none; lead, none; iron, strong trace; zinc, grain per gallon, 0.3; sediment, very little. Microscopic examination: Diatoms, water bacteria. Oxygen for oxidation, grain per gallon, 0.078. This is excellent aqueduct water, except that it contains so much zinc. How extensively are galvanized pipes used to convey this water?

(Signed) EDMUND R. ANGELL.

Derry, N. H., Oct. 8, 1894.

BENNINGTON.

The Bennington Water Company supplies the town with water from two springs, one known as "Cold spring" and the other about 30 rods from that, the two being about one mile east of the village and at the base of a range of hills extending two miles east. The capacity of this natural reservoir is not more than 2,000 gallons. The water passes through a fine wire strainer into the mains, and flows by gravity. There is no arable land within nearly a mile of this basin, and the water-shed is entirely clean. The system has been in operation nine years, and cost from $6,000 to $8,000. Between 50 and 60 families are supplied from the system, being two thirds of all those living in the streets where the pipes are laid. There is about two and a half miles of main pipe, covering three fourths of the village. The supply is ample, but the pipe is not large enough for fire service. The pressure is 65 pounds per square inch,

and during the driest time in the past summer the reservoir was full to the waste outlet almost continually. The water is somewhat warm during the heated term.

[*Analysis of Cold Spring water, Bennington.*]

The water contains, in 1,000,000 grains: Common salt, 5 grains; ammonia, none; carbonates, 26 grains; lime and magnesia, 22 grains; nitrates, 8 grains; lead, none; iron, none; odor, none; aspect, clear. Conclusions: The water contains, sewage, none; drainage water, none; surface water, none; hardness, two and one-half degrees; lead, none. Purity: Scale for alluvial soil, 99 by scale of this soil. General character, an excellent water.

An additional water-supply is contemplated from Lake George, two miles distant, where a large supply of water can be obtained for fire purposes.

BERLIN.

Berlin is supplied with water by the Berlin Aqueduct Company and the Green Aqueduct Company. The source of the first named supply is Bean brook, about one mile from the village, in the foot-hills of Success mountain range. The capacity of this reservoir is 3,000,000 gallons. There are no roads or inhabitants within a mile of the reservoir, which is open, and the water is not filtered before entering the mains. The water flows by force of gravitation. This system cost $120,000, and has been in operation five years. The pressure is from 80 to 125 pounds per square inch, and the supply is ample for all purposes.

The Green Aqueduct Company furnishes water from springs located in a pasture near the town. Their system cost from $6,000 to $10,000, and was introduced some 10 years ago. During the drought of 1894 this supply failed, and the Berlin Aqueduct Company pumped some for a few days. The entire community is supplied with water from these two systems, 900 families in all, and there are 60 hydrants for fire purposes. The water has never been analyzed.

BETHLEHEM.

The Crystal Springs Water Company, the stock of which is owned largely by Hon. Frank Jones, of Portsmouth, fur-

nishes water to the village from a number of springs about two miles distant. The water flows by gravity and the quantity is sufficient at all times. There are 10 hydrants for fire purposes. The system has been in operation about 16 years.

BOSCAWEN.

The water-supply, owned and operated by the town, under the name of the Boscawen and Penacook Water-works, is from Walker's pond, four miles from Boscawen Plains. The area of the basin is 6.875 square-miles, with an estimated daily capacity of 6,000,000 gallons. The water is not filtered before it enters the mains. The system cost $74,000, and has been in operation four years. About 200 families are supplied, being 60 per cent. of the entire community. There are 50 hydrants for fire purposes, and the average pressure is 82 pounds. Two analyses have been made of this water, with excellent results, one by Prof. E. R. Angell, in 1890, and one by Prof. Thomas M. Drown, in 1891.

BRISTOL.

The Bristol Aqueduct Company takes a water-supply from Newfound lake, two miles north-west of the village of Bristol. The lake is 125 feet above the level of the centre of the town, and has an area of nine square miles. The water runs from the dam to the gate-house; thence it is screened into the mains. The system was completed in 1886, at an expense of $23,000. One hundred and seventy families, three fourths of the community, take from this system. The pressure is about 30 pounds to the square inch, and under full head is ample for fire purposes. Forty hydrants are connected with the system. During the spring and early summer there is sometimes a little complaint of the quality of the water, but not so much during the past year. The water has not been analyzed.

CANAAN.

The water-supply, owned and operated by the Crystal Lake Water Company, is taken from Hart's pond (or Crystal lake), which is fed almost entirely by springs, and has an area of about 300 acres. The water flows by gravity, the pressure being 96 pounds to the square inch. The water is not filtered before it enters the mains. The system was introduced some six years ago, and cost $13,000. Forty-three families are supplied from it, one half of the community. There are 12 hydrants for fire purposes. A little complaint is made of a woody taste to the water in June, but no analysis has ever been made.

CANDIA.

The people's water supply is from wells near their buildings, but when the wells are dry, as is often the case, water is taken from springs of the several farms or from the river. Water has also been conducted from a spring located in the woods on a side-hill, by means of a pipe laid under ground. A reservoir was constructed partly in a ledge, the water flowing clear and abundant through a seam in the same.

CLAREMONT.

The Claremont water-supply is furnished by several companies. The Claremont Water-works Company has a series of three reservoirs on Green mountain, so-called, the two upper ones flowing into the lowest, or third, reservoir. The water flows by gravity, and the capacity of the reservoirs is 32,000,000 gallons. The reservoirs are open, and the water is not filtered before entering the mains. No particular precaution is taken to keep the water free from pollution, except that a small ditch is dug around the reservoirs, to keep the road-wash out. There is considerable surface drainage between the upper source of the water and the lower reservoir, and there are also some small brooks that flow into it. After showers there is complaint that the water is much roiled. This system was constructed some

nine years ago, and cost $100,000. Seven hundred families are supplied from it. The pressure is 80 pounds to the square inch, and the supply is ample for fire purposes, with 65 hydrants. An analysis of the water shows it to be very good.

The Bible Hill Aqueduct Company, owned and operated by John Tyler, Esq., furnishes water from springs and one reservoir on Bible hill, Claremont. The reservoir is higher than the springs and is used only when the latter do not furnish a sufficient supply. There are about 30 springs, which flow into one head, all being covered, but the reservoir is open. The capacity of the system is 20,000,000 gallons, with a daily capacity of 60,000 gallons. The water from the reservoir is filtered through three feet of sand, frequently renewed. Mr. Tyler uses a two-inch pipe for his main, and the water runs from a small gauge, giving 60 gallons per day for each family, 300 being supplied from his system. There is a pressure of 55 pounds per square inch on this water, but the pipes are too small to supply the same for fire purposes, and there are no hydrants connected with the system. The system was constructed 24 years since, and cost from $30,000 to $35,000.

The third system, owned and operated by Mr. H. E. Grannis, is known as the Grannis Water-works, and has its source in a spring and small reservoir in West Claremont, to which place it furnishes water. The capacity is 100,000 gallons, and the water flows by gravity. The reservoir is uncovered and the water is not filtered before entering the mains. The system has been in operation four years, supplying 20 families, and cost from $2,000 to $3,000. The pressure is 47 pounds, but the pipes used do not furnish a sufficient supply for fire purposes. The water has not been analyzed.

COLEBROOK.

The Annis Water-works, owned and operated by Mr. Annis, have a source in seven springs on Lombard's hill,

one eighth of a mile from the village. The water sometimes flows directly into the mains, and at other times is collected in a large intermediate cistern, or reservoir. The source is about 100 feet higher than any residence nearer than half a mile, and not more than four houses are above or higher within a radius of one mile. The capacity of the reservoir is 42,000 gallons, while the average consumption is 24,000 gallons in winter and 30,000 gallons in summer, per day. The reservoir is covered, but the water is not filtered before entering the mains. The water-shed is used for pasturage, but the surroundings on the whole are very good. The system has been in use 17 years; the cost of construction was about $12,000. One hundred families are supplied from it. The supply is ample for all purposes, and there are three hydrants and four stand-pipes for use in case of fire. The water has been analyzed many times and is considered very pure.

CONCORD.

The water-supply, owned and operated by the city, under the name of the Concord Water-works, is taken from Penacook lake, near the village of West Concord, and north-west of the city proper. A portion of the city has a low service, the water flowing from the lake directly into the mains. The supply for the high service flows east and south three miles to a pumping station, thence through force mains west about one half a mile to a reservoir having a capacity of 2,000,000 gallons. The city owns and controls nearly all the land on the north and west shores of the lake, as well as a portion of the eastern shore. During low water the shores are cleared of all stumps and debris. The pressure of the domestic service is 42 pounds per square inch; of the fire service, 83 pounds. There are 243 public and 30 private hydrants. The system has been in operation since 1872 and the cost of construction to Jan. 1, 1896, was $840,057.28. About 90 per cent. of the community, 3,675 families, are supplied from this system.

Following are analyses of this water:

SANITARY ANALYSIS OF WATER, OCT. 31, 1893.

Sample No. 1, taken from over intake.

Odorless	
Colorless	
Evaporation	nearly quiet
Residue	white, with few circles
Ignition of residue	it darkens some
Solids, grains per gallon	2.1
Loss on ignition, grains per gallon	1.5
Hardness, degrees	0.7
Alkalinity, degrees	0.6
Chlorine, grains per gallon	0.1
Free ammonia, part per million	0.03
Albuminoid ammonia, part per million	0.098
Nitric acid	merest trace
Nitrous acid	none
Poisonous metals	none
Iron	trace
Sediment	scarcely any
Microscopic examination	nothing important
Oxygen for oxidation, grain per gallon	0.135
Bacteria, per 1-100 c. c. at 68° F	1
Bacteria per 1-100 c. c. at blood temperature	0

This is excellent water.

Sample No. 2, taken 100 feet from intake.

Odorless	
Color	very slight yellowish tint
Evaporation	nearly quiet
Residue	white, with few circles
Ignition of residue	it blackens some
Solids, grains per gallon	1.6
Loss on ignition, grains per gallon	0.9
Hardness, degrees	0.7
Alkalinity, degrees	0.6
Chlorine, grains per gallon	0.1
Free ammonia, part per million	0.01
Albuminoid ammonia, part permillion	0.10
Nitric acid	merest trace
Nitrous acid	none
Poisonous metals	none
Iron	trace
Sediment	scarcely any
Microscopic examination	nothing important
Oxygen for oxidation, grains per gallon	0.156
Bacteria per 1-100 c. c. at 68° F	2
Bacteria per 1-100 c. c. at blood temperature	0

This is excellent water.

CONWAY.

The North Conway Water & Improvement Company furnishes water to North Conway from Artist's Falls brook and from Mountain brook, located on the hills east of North Conway village. The storage basins or reservoirs are at the source, about two miles from the village, the former having a capacity of 1,000,000 gallons, and the latter of 1,500,000 gallons. These reservoirs are open and the water is not filtered before entering the mains. There are no residences on the streams above the reservoirs, and the surroundings are free from contaminating influences. The system has been in operation about 13 years, and there has been a noticeable diminution in the number of cases of typhoid fever in that time. About 175 families, or 98 per cent. of the community, are supplied from this system. The pressure of the water is in the one case 76 pounds, and in the other 100 pounds, per square inch. The supply is sufficient for all purposes, and there are 25 hydrants connected with the system. The water has never been analyzed.

DERRY.

Derry is furnished with water by the Derry Water-works Company, from driven wells about three fourths of a mile west of Derry Depot. A steam pump is used at the wells to force the water into a stand-pipe at the other end of the system, two and a half miles distant, the stand-pipe being 30 feet in diameter and 35 feet high. By pumping two hours per day, the supply is sufficient for present needs, the daily consumption being about 6,000 gallons in winter, and 8,000 gallons in summer. The stand-pipe is open, and the water is not filtered before entering the mains; all due precaution is taken, however, to prevent the pollution of the water. There is 70 pounds' head on this system, with 45 hydrants, and the supply is ample for all purposes. About 250 families, or 85 per cent. of the people on the line, are supplied from this system, which has been in use about six years.

There has been a decided improvement in the general health of the people since its introduction.

EATON.

The principal water-supply is from wells, but about 15 families are supplied from mountain springs brought to the houses in pipes, chiefly lead; all private.

ENFIELD.

There are two water companies in this village. One has 33 shares, and each shareholder is entitled to 40 gallons of water each 48 hours; during a very dry season the supply is short. The other company is composed of some eight individuals, and their supply is sufficient at all times. The majority of the families are supplied from private sources, as the hills around the village furnish excellent water.

Enfield Centre is supplied with water from the springs around the village, but they have no water company.

EXETER.

About ten years ago the Exeter Water-works Company introduced a water-supply from a brook, fed largely by springs, three fourths of a mile east of Exeter village. Water is pumped by steam power into a stand-pipe, and is filtered by the National and Jewell process. The capacity of the system is 211,000 gallons. The average daily consumption in December, 1893, was 160,199 gallons, and in July of the same year, 184,187 gallons. Over $1,000 was expended in 1893, in cleaning out the basin and raking over the water-shed. The basin is surrounded by a good fence. The pressure is 50 pounds per square inch. Many complaints have been made against the color of this water, which is of a yellowish tinge, and at the upper end of the town, the odor is very disagreeable. The water has been analyzed, with favorable results in every instance. This system supplies 650 families, being three fourths of the entire population, and there are 55 hydrants connected with it.

FRANCESTOWN.

The water-works of this town are owned and operated by the Francestown Water Company, the source being a spring about three fourths of a mile north-west of the village. The spring is covered, and the water flows directly into the mains without filtration. The system has been supplying water about 17 years and furnishes an amply amount to 35 families, when used prudently. Water has been brought from this spring to the village for nearly 100 years, —for the first 60 to 70 years in wooden logs, and for the past 17 years in excellent iron pipe. An additional water-supply is contemplated in this town. Following is an analysis of the water now in use:

[*Analysis Francestown Water Company.*]

The water contains in 1,000,000 grains: Common salt, 5 grains; ammonia, 0; carbonates, 17; lime and magnesia, 9; nitrates, 12; lead, 0; iron, 0; odor, none; aspect, clear, sewage, none; drainage water, none, or only a trace; surface water, none or only a trace; hardness, one degree (very soft); lead, none. Purity (scale of alluvial soil), .985 by scale of this soil. General character: An excellent water. Most of the conclusions can hardly be applied to this water, as it is evidently not a well-water from the vicinity of human dwellings, but the presence of some nitrates might indicate a small amount of agriculture near the source from which the spring rises.

(Signed) CHARLES MAYO.

Springfield, Mass., Aug. 9, 1887.

FRANCONIA.

The Franconia Aqueduct Company supplies water from a spring in the town, about one third of a mile from the first house supplied. The water flows by gravity. Patrons are limited to 100 gallons a day. The spring is covered, but the water is not filtered before it enters the mains. Thirty-two families take from this supply, which cost to construct, in 1892, $2,500. The supply is not sufficient for fire purposes, neither has it been analyzed.

FRANKLIN.

The water-supply, owned by the town, under the name of the Franklin, N. H., Water-works, is from springs to the south and east of the village limits. The water is conveyed to a pumping station and is pumped into the mains and through them to a covered reservoir, giving a head of over 200 feet. Water is also sometimes taken from the Winnipesaukee river in case of necessity, for fire purposes. The capacity of the reservoir is 504,300 gallons, while the average daily consumption in winter is 160,000 gallons, and in summer 204,000 gallons. The reservoir is covered, but the water is not filtered before entering the mains. The springs are surrounded by a large extent of unoccupied land, so that there is small danger of pollution. There has been a marked decrease in the number of typhoid-fever cases since the introduction of this water, some five years since. The cost of construction was $100,000, and 530 families are supplied, about three fourths of the community. The average number of pounds' pressure per square inch is 92, and there are 80 hydrants.

[*Analysis Franklin aqueduct water.*]

Odorless; colorless; evaporation, quiet; residue, uniform and white; solids, grains per gallon, 2.5; loss on ignition, 0.8; hardness, degrees, 1.5; alkalinity, degrees, 1.0; chlorine, grains per gallon, 0.2; free ammonia, part per million, 0.04; albuminoid ammonia, part per million, 0.03; nitric acid, little; nitrous acid, none; poisonous metals, none; iron, trace; sediment, little. Microscopic examination: Few infusoria and bacteria, diatoms, algae. Oxygen for oxidation, grains per gallon, 0.019. This is excellent water.

(Signed) . EDMUND R. ANGELL.

Derry, N. H., May 1, 1894.

GILSUM.

A few years ago the construction of a public water-supply for the village was contemplated, for fire and domestic uses. Two reservoirs were constructed for the use of the fire

department, but nothing has been done to supply the village with water for domestic purposes.

GOFFSTOWN.

The water-supply is owned by the precinct, under the name of the Goffstown Village Fire Precinct Water-works and is taken from Whittle brook, on the north slope of Uncanoonuc mountain. The reservoir has an area of two acres, in the midst of a plat of nine acres, owned by the company. This was cleared from trees and laid down to grass; the plot is fenced and kept free from everything that might pollute the water. The stream flows for about one fourth of a mile above the reservoir through rushes, and above that for one fourth of a mile through a sheep pasture. The water is a little colored from vegetable matter in the swamp at the head of the stream, and the taste is somewhat impaired; it is improving with time and use. The reservoir is not covered, neither is the water filtered before entering the mains. The cost of construction, five years since, was $42,000; 170 families take the water, four fifths of the precinct. The average pressure upon the water is from 75 to 100 pounds; 41 hydrants for fire purposes. There has not been a case of contagious or infectious disease in any family using this water, while there have been several such cases where well-water was used.

GORHAM.

The Alpine Aqueduct Company in December, 1873, introduced water to this town from springs, stoned and covered with plank, one mile west of the village, and on the north side of a mountain. A brick reservoir of 10,000 gallons' capacity supplies the village with water. The water is filtered through copper strainers only. A ditch is dug around the upper side of the springs, to exclude surface water, and nearly all the springs are fenced around. The cost of the system to date is $29,000. Two hundred families, nearly all in the community, are supplied from this system, and there has been a marked improvement to the general

health since its introduction. The standing pressure is 56 pounds per square inch, and is sufficient for fire purposes. There are 12 hydrants connected. The main pipes are 4-inch, 3-inch and 2-inch, R. D. Wood & Co. cast iron, while the service pipes are 1-inch, ¾-inch and ⅜-inch galvanized iron. Following is an analysis of the Alpine aqueduct water, by Prof. Franklin C. Robinson, professor of chemistry and assayer for the state of Maine, Bowdoin college, Brunswick, Me., June 27, 1892:

[*Analysis of Alpine aqueduct water.*]

Total dissolved solid matter, 2.6 grains per U. S. gallons; of this 2.02 grains are mineral, .58 grains organic. The mineral is as follows: Silica, .75 grains per gallon; iron carbonate, .03; calcium carbonate, .34; calcium sulphate, .16; magnesium carbonate, .17; sodium chloride, .18; sodium carbonate, .30; potassium carbonate, .08; nitrites, none; nitrates, trace. I found that the organic matter was mostly vegetable, as by the ammonia test it gave free ammonia, .002 parts in 100,000 of water, and albuminoid, .0044. The water is hence a water of great purity and can only give the best results when used for all domestic purposes. If you can supply your town with plenty of such water the citizens are to be congratulated.

GROVETON (NORTHUMBERLAND.)

The village has been supplied with water from springs for the past six years, but it was not sufficient for fire purposes. The present system was completed about a year ago by the Northumberland Water Company. The supply is taken from springs and a brook in the town of Stark, on the mountain a short distance from the town line. The source and first storage basin is a little over two miles from the village of Groveton, with an elevation of 550 feet. The reservoir on the hill near the village is supplied by a six-inch pipe from the first-named storage. The capacity of the storage basins is between 500,000 and 600,000 gallons, with a daily capacity of somewhat more than this, while the average daily consumption is about two thirds of that amount.

The reservoirs are open, and the water is not filtered before entering the mains. No special precautions are taken to protect the waters from impurities, as the situation is such that none are required, other than a high fence. The cost of this system was about $40,000. A majority of the community, or 135 families, are supplied from it. The pressure is from 75 to 80 pounds per square inch. There are 35 hydrants for fire purposes, and two way hydrants. There has been no complete analysis made of this water.

HANCOCK.

The water-supply of this town is from springs on the hills adjacent to the town, and conducted to the town in lead and iron pipes. Water has been taken from this source since the town was first settled, there being but two wells in the village. Forty-five families and two hotels are supplied from the springs. The supply is ample in quantity, but the pressure is not sufficient for fire purposes.

HANOVER.

The water-works of this town are owned jointly by Dartmouth College and the village precinct, under the name of the Hanover Water-works Company. The system has been in operation since 1893, and cost upwards of $65,000. The source of the supply is Camp brook, two and a half miles from the village, dammed so as to form a reservoir of 32½ acres in extent and with a capacity of 116,000,000 gallons. The head of water is 155 feet at the college campus. This water is colored and carries considerable organic impurity. After the ice forms, so as to exclude air, the color deepens and an unpleasant taste and odor are noticeable. This has been relieved by blowing off, both at the gate-house and in the village, when the supply on hand warranted the waste. The quality of the water is very fair in the spring, when the abundant in-flow permits a virtual emptying and refilling of the pond. Most of the land flowed was meadow, and about 4½ acres was woodland, which was cleared off and

all stumps and roots blown out and removed to 3 inches below the surface. The soil is from 3 inches to 6 inches or more of mold or wood mucks, on impervious clay.

This water was introduced for general purposes only, with no expectation that it would be desirable or suitable for drinking until after two or three years from the first flooding of the meadow; some of the people, however, are drinking it. The old aqueduct company furnishes water for drinking purposes, from mountain springs two miles distant.

HAVERHILL.

The Haverhill Water Company furnished water for Haverhill proper, from boiling springs located on high ground about three fourths of a mile from the village. The water flows directly from the source into the mains, the springs being covered and the in-take protected by a screen. The first cost of the works, 65 years or more since, was $1,600, and upwards of $1,000 have since been expended upon the same. Between 40 and 50 families are supplied with water from this source, being nearly the entire village. While the supply has failed once or twice during the very dry seasons, the amount of water is usually sufficient for all purposes except fire. There are no hydrants connected with the system. The water has been analyzed a number of times, and always pronounced pure.

Ten or twelve families at the south of the village are supplied from a spring near there, and which has been running 70 years or more. Mr. W. F. Westgate is laying another line of pipe, which will supply some other families.

NORTH HAVERHILL.

The North Haverhill Water Company has introduced water from a spring about one mile from that village. The source is on high ground, and the water flows by gravity directly into the mains. The spring is covered, and the in-take is protected by a strainer. This system, which has been in use 40 years or more, cost originally about $2,000,

and about $400 has since been expended in repairs upon the same. Some 20 families take from this supply,—about one fourth of the community. The supply is sufficient for all purposes except fire. There are no hydrants.

The E. R. Weeks Water Company also supplies water from springs to eight or ten families, at an original outlay of $826. In addition to these two systems there are six other water companies, each supplying from five to eight families with spring water.

The Oliverian Brook Water-works Company furnishes water to Oliverian village, about three fourths of a mile from Haverhill and in that township, from a spring one half of a mile from that village. This spring is situated on high ground, is covered, and the water flows directly into the mains, which are protected by a strainer. The supply is sufficient for all purposes except fire; there are no hydrants. The system cost about $600; has been in use upwards of 40 years, and supplies 10 or 12 families.

WOODSVILLE (in Haverhill).

The Woodsville Water Company takes its supply from the Ammonoosuc river, within three rods of a dwelling house and the highway crossing the river. To the present time about $32,136 has been expended on this system, which has been in operation some 10 years. Probably 275 families are supplied from it. The pressure of the water for fire purposes is 85 pounds per square inch; there are 22 hydrants. It is said that the water has been analyzed and pronounced good, although there is quite serious complaint against it.

Some 10 or 12 families are supplied with spring water pumped by wind wheel.

HENNIKER.

Water is supplied to this town by three different companies. The Henniker Spring Water Company introduced a system about 12 years ago, at an expense of $6,000. The source is about three fourths of a mile north of the village,

where they have a reservoir, covered, with a capacity of 3,700 barrels. The water is not filtered before it enters the mains. This water is supplied to some 70 families, and has a fall of 230 feet. Connected with the system are eight hydrants.

Gove Bros. take a supply from Proctor hill, one fourth of a mile from village. Their reservoir has a capacity of 900 barrels, and they supply 10 families. This system is not yet completed, although they have already expended $3,500 upon it. The fall of this water is about 100 feet.

George W. S. Dow supplies water to 12 families from a reservoir, at the foot of a hill near the village, with a capacity of 70 barrels. This system cost $500, about 17 years ago. This water, although considered the best of the springs, is not available for all purposes, owing to its low pressure, only 30 feet fall. All these waters flow by gravity. Only one case of typhoid fever now occurs where before the introduction of these water-systems there were 10 or 12 cases a year.

HILLSBOROUGH.

Water is supplied by the Hillsborough Water Company, from Loon lake, at Hillsborough Centre. The reservoir has a capacity of 600,000 gallons, is uncovered, and the water is not filtered before entering the mains. This system has been in operation 10 years, and the original cost of construction was $50,000. Two hundred and fifty families are supplied, being four fifths of the entire community. The pressure is 85 pounds per square inch, with 34 hydrants for fire purposes. There has been a noticeable improvement in the health of this community since the introduction of the water-supply. The water has been analyzed.

HOOKSETT.

A private company furnishes the town with water from a spring on one side of the river, and from a pond on the other side. In the old system, constructed 14 years ago, the water is pumped into a covered reservoir, holding 375 bar-

rels. In the autumn of 1894 an additional reservoir, holding 800,000 gallons, was constructed. The water had not been filtered until recently. About 50 families are supplied from these systems. The pressure is sufficient for fire purposes in a portion of the valley. The pond water has been analyzed,but the spring has not.

HOPKINTON.

The Hopkinton Aqueduct Association takes its supply from springs at the south-east base of Putney hill. The water flows directly from the source into the mains, by gravity. The springs and wells are covered, but the water is not filtered before entering the mains. Water has been taken from this source for about 40 years, and the supply is ample except during extreme drouth. About 40 families, or two thirds of the community, are thus supplied. The pressure is not sufficient for fire purposes. The water has not been analyzed.

HUDSON.

About five years ago the Hudson Water-works Company inaugurated a system of water-works, at an expense of $20,000. They dug a well 24 feet deep and 25 feet in diameter, about 250 feet distant from a pond, the outlet to Otarmic pond, in Hudson. The top of the well is on a level with the bottom of the lake, and it contains from 12 to 13 feet of water at all times. Water from this well is pumped by steam power through a mile and a half of pipe to a stand-pipe. The well is roofed and well ventilated, and the in-take of the main is protected by a fine strainer. The capacity of this reservoir is 50,000 gallons. The land in the immediate vicinity of it is owned by the water company, and is carefully guarded against impurities of any kind and so graded that no surface water can enter the well. The pressure is 45 pounds per square inch, with 125 pounds' pressure for fire purposes. There are nine hydrants, so connected that the stand-pipe can be shut off and water pumped directly from the mains. No analysis has been made of the water.

LANCASTER.

The water-supply, owned and operated by the town, under the name of the Lancaster Water-works, is from Garland brook, situated in Pilot mountain range, in Kilkenny township. The water is conducted from the supply basin, constructed in the brook at an elevation of 450 feet above the village and 5½ miles distant, to the reservoir one half mile from the village and 190 feet higher, in a six-inch main, connected with the reservoir by a Y; thence to the village by a twelve-inch main, from which the consumer is supplied. The reservoir is for fire purposes only. The capacity of this system is 2,000,000 gallons, with an average daily consumption of about 40,000 gallons in winter and 100,000 gallons in summer. The storage basin is uncovered, and the water is not filtered before entering the mains, the source being remote from dwellings. The cost of construction was $75,000 four years since, and 300 families are supplied. There is a pressure of 80 pounds per square inch on the water, and 59 hydrants are connected. This water has not been analyzed. The town has been remarkably free from zymotic diseases in recent years, and of the few cases that do occur, some at least have been due to polluted well-water.

LEBANON.

The precinct owns its own water-works, under the name of the Lebanon Centre Village Fire Precinct Water-works. The source of the supply is Mascoma river, the outlet of Mascoma lake, Enfield, N. H. The storage reservoir has a capacity of 1,000,000 gallons, with an estimated average consumption of 200,000 gallons in winter and 250,000 gallons in summer. The system has been in operation since 1887, at an original cost of $40,000. Five hundred families are supplied. The pressure is 110 pounds per square inch, and there are 62 hydrants for fire purposes. Occasionally, during the warmest part of the season, some complaint is made on account of the odor of the water, and also against the

dumping of sawdust and all kinds of sewage into the stream emptying into Mascoma lake at Enfield Centre.

LINCOLN.

Water is supplied by a company from Mountain brook, in the eastern part of the town. The reservoir has a capacity of about 50,000 gallons, and flows by gravity, with a fall of 143 feet. The system cost $2,000, completed in 1892, and supplies 35 families, the entire community. The supply is ample for all purposes, one hydrant being connected for fire purposes. The water has not been analyzed. The reservoir is not covered, nor is the water filtered before entering the mains.

LITTLETON.

The Littleton Water & Electric Light Company furnishes water from two sources: A gravity supply from springs, two and a half miles from the village, and also from a pumping station on the river above the village. The reservoir has a capacity of 550,000 gallons, while the daily capacity of the system is 300,000 gallons. The reservoir is covered, and the surroundings are naturally clean and free from contaminating influences. The river water is filtered before it enters the mains, but the spring water is not. The cost of construction, 15 years since, was $80,000, and 175 families are supplied. There are 57 hydrants, with a pressure of 120 pounds per square inch on the water.

LYME.

The village of Lyme Plains is supplied with water by the Lyme Aqueduct Company, from living springs among the hills three fourths to one mile distant from the town, and 85 to 100 feet above it. The reservoir capacity of the system is 17,000 gallons. The springs are covered, and the water flows directly from them into the mains, without being filtered. There are no dwellings within one mile of the springs. This system has been in operation about 64 years, and cost from $2,500 to $3,000. Thirty-six families,

or nearly all in the community of Lyme Plains, are supplied from this source. The supply is sufficient for domestic purposes, and is not intended for use in case of fire. No analysis has been made of this water.

MANCHESTER.

The city of Manchester owns and operates its water-supply, under the name of the Manchester Water-works. The source of the supply is Massabesic lake, situated in Auburn and Manchester. Connected with the system are two reservoirs, one about one mile and a half from the lake and two and a half miles from the city hall, and the other about two miles from the lake and one mile from the city hall. Both steam power and gravity are employed. The low service has a capacity of 15,000,000 gallons and has been in operation 23 years, and the high service, 4,000,000 gallons, in use two years. The daily capacity of the system is 10,000,000 gallons, while the daily average consumption, both summer and winter, is about 3,500,000 gallons. About as much water is wasted in winter from running pipes to prevent freezing, as is used by hose in summer. The reservoirs are open, and the water is not filtered before entering the mains. Rules are made by the board of health to keep the water-shed free from polluting substances, which, in conjunction with the laws of the state, are fairly well enforced by the board through its sanitary inspectors, who visit the lake every day during the summer season. A large part of the lake shore is high ground and is as clean as such land naturally would be, with the exception of certain sections upon which summer cottages have been erected. Nearly all of the owners take precautions to prevent pollution of the lake from the cottages. There are some bogs about the lake which contain quite an amount of decaying vegetable matter. A certain section of patrons, served by the high pressure reservoir, complained in the spring of 1896 of a peculiar taste in the water; several samples were sent away for analysis, the results of which showed the cause to be

decaying vegetable matter. Only a small portion of the service was affected, and that only for a short time. Analyses of the water have been made several times. Both these systems cost about $1,350,000. About 93 per cent. of the community, or 10,813 families, are supplied. The pressure is 60 pounds per square inch. The high pressure service is sufficient for fire purposes; the low, is not. There are 690 hydrants for fire purposes.

MERIDEN.

The Meriden Water-works Company furnishes water to the village from springs one mile and a quarter distant. The water flows from the springs into two reservoirs only a few rods away, one having a capacity of 32,000 gallons, and the other of 9,600 gallons. The main is a 2½-inch iron pipe. The system, which supplies 13 families and three boarding houses, was completed in 1891, at a cost of $3,800. The water has a fall of 250 feet, and is ample for fire purposes, although the supply is not sufficient for the summer population. A larger supply is contemplated.

MILFORD.

The water-supply, owned by the town, under the name of the Milford Water-works, is from two wells: The one supplied from five smaller wells, each 40 feet deep, sunk in the bottom of the large well, and water from a stream which flows three fourths of the way around it, percolates through the brick walls of the well also. This source is now used for fire purposes only. A second well was constructed in 1893, supplied by an immense spring flowing from beneath a hill near by, and furnishing an inexhaustible supply of fine water. The water is pumped to a stand-pipe 75 feet high, 1,000 feet east of source and 155 feet higher. The capacity of the reservoir or well is 275,000 gallons; the daily capacity of the system is 1,250,000 gallons; the average daily consumption in winter is 80,000 gallons, and in summer 175,000 gallons. The reservoir is uncovered, and the water is not filtered before entering the mains. The system cost $62,000, and supplies

300 families, about two thirds of those coming within its reach taking from it. The average pressure is 80 pounds per square inch; 52 hydrants are connected with the system. The water of both wells has been analyzed several times by different chemists. The general health of the community is noticeably improved since the introduction of this water.

NASHUA.

The city is supplied with water by the Pennichuck Water-works Company, from Pennichuck ponds about three miles from the city. The water is pumped to a reservoir about one mile and a half from the city, having a capacity of 4,000,000 gallons. The daily capacity of the system is 16,000,000 gallons, and the average daily consumption is from 3,000,000 to 4,000,000 gallons. The land about the source of the supply is owned by the company, and is fenced about. The pressure on the water is from 20 to 60 pounds per square inch. There are 206 hydrants connected with the system; the supply is ample for all purposes. This system has been in operation since 1852, and supplies about seven-eighths of the entire community. The water has been analyzed.

NEWMARKET.

The water-supply of this town, owned and operated by the Newmarket Water Company, is from pure springs running into a brook. The first of these springs is located in Lee, while the remainder are in the town. The brook runs through fields and pastures where there are horses and cattle and nothing to prevent their standing in the water during the warm season, as the brook is covered only for about one fourth of a mile above the pumping station. The water is pumped to a stand-pipe at an elevation of nearly 200 feet above the village, while the source of the water is about on a level with the town. The capacity of the stand-pipe is 212,000 gallons, while the daily capacity of the system is 2,300,000; about 70,000 gallons is the daily average for the winter season, and 80,000 for summer. The system has been

completed about 18 months, and cost $50,000. Two hundred and seventy-seven families take from it,—about one half of the community. The pressure of the water is 90 pounds per square inch; there are 51 hydrants connected, and the supply is ample for all purposes. There has been no analysis of this water, and there has been some complaint of the quality. The reservoir is uncovered, and the water is not filtered before entering the mains.

NEWPORT.

The town system of water-works, under the name of the Newport Water-works, was completed in November, 1894. The source is Gilman pond, in Unity, N. H. The water is conveyed from the pond to a reservoir 25,000 feet distant, with a fall of 170 feet. This reservoir is 5,500 feet distant from the centre of the village of Newport, and 280 feet higher. The capacity of the reservoir is 600,000 gallons. The average pressure is 117 pounds per square inch, and there are 50 hydrants for fire purposes. The system cost $56,000; 104 families, or one fourth of the community, were supplied on the opening of the system. Gilman pond was very low during the season of 1894, and, taking advantage of that condition, the entire shore, from high-water mark to some distance below low-water mark, was cleared of decaying vegetable matter. A large quantity of logs and limbs were removed. The shore of this pond is entirely free from low or swampy places, being composed entirely of sand, pebbles, or rock. Two small streams empty into the pond during an ordinary wet time, but during the summer of 1894 they were dry nearly all the time, while quite a stream was flowing from the pond, showing that it is fed largely by springs. The pond has an area of 62 acres, with 50 feet of water over the larger part of it. In the whole watershed of the pond there are only four farm houses, no one of which is within a quarter of a mile of the shore. There is no probability of contamination from these buildings, but they will be watched, and measures taken to have

the Newport board of health notified in case of the appearance of any contagious disease in them.

NORTHFIELD.

Water from a pond in the town is furnished by the Tilton & Northfield Aqueduct Company. The water flows by gravity from a reservoir of 3,000,000 gallons' capacity. The reservoir is open, but fenced, and the water enters the mains unfiltered. The system has been in operation about eight years and supplies about 300 families, three fourths of the community. The pressure is 80 pounds per square inch. The supply is ample for all purposes, with 28 hydrants connected. The water has been analyzed.

PEMBROKE.

The Suncook Water-works Company supplies the village of Suncook with water from springs located on high ground just outside the village. Two reservoirs are located in the southerly outskirts of the village, in the town of Allenstown, and three reservoirs to the north of the village, in the town of Pembroke. The aggregate capacity of these five reservoirs is about 325,000 gallons, with an average daily consumption of about 10,000 gallons. The reservoirs are covered, but the water is not filtered before entering the mains. The land in the vicinity of the reservoirs is laid down to grass, and there are no sewage or other polluting substances near them. The system was constructed about 11 years ago, at an expense of $10,000, estimated cost. One hundred and fifty families are supplied from this source, being about one fourth of the community. During a dry season the supply from the springs is not sufficient, and water is pumped into the reservoirs from Suncook river, at which time there is some complaint of the quality of the water. The spring water has not been analyzed.

PETERBOROUGH.

A gravity system of water-works is under consideration in the town. At present there is no public system.

PITTSFIELD.

The Pittsfield Aqueduct Company, in 1884, introduced water from Berry pond, situated in a ravine on Catamount mountain. The reservoir is one half mile from the source, and a mile and a half from the village, in a southeasterly direction. The capacity is 1,700,000 gallons, and the daily capacity of the system is a ten-inch pipe with 70 pounds' pressure per square inch. The average daily consumption in winter is 400,000 gallons; in summer, 500,000 gallons. The reservoir is uncovered, and the in-take of the main is protected by a strainer only. The system cost from $40,000 to $50,000. About 400 families are supplied from it. This water has been analyzed.

PORTSMOUTH.

The city owns and operates its water-supply under the name of the Portsmouth Water-works. The source is driven wells and springs situated in different localities from two to three miles from the city. About 20 per cent. of the water flows directly from the source into the mains. There is a stand-pipe in the suburbs of the city, to which water is pumped by steam power. The capacity of the storage basin is 500,000 gallons, while the daily capacity of the system is about 2,000,000. The stand-pipe is uncovered, and the water is not filtered before entering the mains. Most of the land about the sources is owned by the city, and is kept free from contamination. The pressure on this water is 60 pounds per square inch, and is sufficient for fire purposes, there being 120 hydrants. The system has been in operation since 1890, and the cost of construction was $175,000. There are 1,900 takers, the entire community. The water has never been analyzed; it comes from gravel beds, and with the exception of a slight hardness, is considered very pure and wholesome.

PLYMOUTH.

Plymouth village is supplied with water by the Plymouth Aqueduct & Water Company, from springs situated about a mile to the north of the village. Water is conducted from several large springs, by small tiling, to two reservoirs, the capacity of which is about 3,000,000 gallons. The daily capacity of the system is about 100,000 gallons, and the average daily consumption 75,000 gallons. The reservoirs are uncovered, and the water is not filtered before entering the mains. The reservoirs are fenced about, and no sewage or other pollution can enter them. There is a pressure of from 50 to 80 pounds per square inch on the water, and 27 hydrants are connected. The system cost, in 1881, about $38,000. One hundred and fifty families are supplied from it, four fifths of the community.

[*Sanitary Analysis of Water from Plymouth Aqueduct & Water Company.*]

Odorless; color, yellowish; evaporation, some foamy; residue, yellowish and some circles; ignition of residue, it blackens; solids, grains per gallon, 3.1; loss on ignition, 0.7; hardness, degrees, 1.5; alkalinity, degrees, 1.0; chlorine, grain per gallon, 0.05; free ammonia, part per million, 0.03; albuminoid ammonia, part per million, 0.11; nitric acid, trace; nitrous acid, none; iron, trace; lead, none; sediment, scarcely any. Microscopic examination: Nothing important. Oxygen for oxidation, grain per gallon, 0.238. This is very good aqueduct water.

(Signed) EDMUND R. ANGELL.

Derry, N. H., May 2, 1892.

RAYMOND.

The water-supply, owned and operated by the town, under the name of the Raymond Water System, is from a series of driven wells, on the bank of Lamprey river, near the village of Raymond. The wells are situated in a meadow, which is overflowed by the river during a portion of the year, and there is an accumulation of muck near the surface, which is covered with grass. The water is pumped

by steam power to a stand-pipe about one fourth of a mile distant, in a southerly direction. The capacity of the stand-pipe is about 120,000 gallons, with a capacity of 300,000 gallons daily for the system. The average daily consumption is from 28,000 gallons to 40,000 gallons during the entire year. The wells are open, and the water is not filtered before entering the mains. The system does not furnish as much water as was contemplated, although sufficient for present needs, and the number of wells is to be increased. The system cost $27,000, in 1893. There is a pressure of about 65 pounds per square inch, and 23 hydrants are provided for fire purposes. Seventy families take the water. Sometimes takers near the closed ends of the mains complain of the milky appearance of the water, which is remedied by opening a hydrant near the end for a short time. The water has improved since the opening of the system, as Prof. Angell in his analysis thought it would do.

ROCHESTER.

The town water-works, under the name of the Rochester Water-works, is from a natural pond and brooks in Rochester and Barrington. The source and storage basin are about four miles north-west of the town. The water flows by force of gravitation. There is a stand-pipe of 350,000 gallons' capacity, and a reservoir with an area of 55 acres and an average depth of 16 feet, connected with the system. The reservoir is fenced and well protected. The cost of construction, 10 years since, was $200,000. Twelve hundred families are supplied from it. The pressure is from 70 to 90 pounds per square inch, and is sufficient for fire purposes, with 150 hydrants. In 1895 there was some complaint of the water, caused by a very extensive growth of algae in the reservoir. The water has been analyzed several times.

ROLLINSFORD.

A water-supply is furnished by the Salmon Falls Manufacturing Company from the river. The water is pumped to

a stand-pipe, and is sufficient for fire purposes, with 10 hydrants connected. The system has been in operation four or five years, and supplies about 50 families, the compact part of the village. This system is the private property of the Salmon Falls Manufacturing Company, and is used by them chiefly for fire purposes and the filling of the cisterns of their tenants; it is never used for drinking purposes. The stand-pipe was put in for the purpose of supplying water for automatic sprinklers in the mills and for flushing water-closets. It is practically no system at all, except for fire purposes.

SOMERSWORTH.

The water-supply, owned and operated by the city, under the name of the Somersworth Water-works, is taken from Salmon Falls river, one half mile above the city proper. The water is pumped to a stand-pipe, of 913,000 gallons' capacity, on Prospect hill, one half mile from pumping station and river. The daily capacity of the system is 2,000,000 gallons, and the average daily consumption is from 400,000 to 500,000 gallons. The stand-pipe is open. The water is not filtered at present, but a filter bed is now in process of construction, such an one as is used at Lawrence, Mass.

SUNAPEE.

The water-supply of Sunapee is taken from Sunapee lake, by the Lake Sunapee Water-supply Company. The lake is about 70 feet higher than the lowest places supplied, and the water flows by gravity directly into the supply pipes, without filtration. A two-inch pipe is use, which is not sufficient for fire purposes, although there are four hydrants connected. The system has been in use nine years, and 25 families are supplied from it.

WARNER.

The Silver Lake Water Company has recently introduced water from a brook, which is made up of several small

streams from the hills around. The reservoir, made by damming the brook, is about one mile and a quarter from the village, and has an area of from one to two acres and a depth of from one to six feet. The reservoir is open, and the water is not filtered before entering the mains. The surroundings are fairly free from contaminating influences; the wash from one hill-road is turned aside, otherwise no special precautions are taken. The system cost in construction about $13,000. A hundred families ought to have water, but very few will take from this system for family use, as the prices are too high—$8.00 per single faucet, neither have the people confidence in the purity of the water. It is thought that the reservoir was not properly cleaned of muck and vegetable matter, and that in a dry season the water will be very low and unfit for use. Most of the families are supplied with aqueduct water from springs and wells on the hill-sides adjoining the village, which is a generally healthful source of supply. A few have old wells which it is feared would not bear investigation. Fifteen or 16 hydrants have been put in by the water company before mentioned, but the precinct has not yet contracted for them; the pressure on the water is perhaps 50 pounds per square inch.

WHITEFIELD.

The water-supply, owned by the village, is from springs in Jefferson, N. H. The reservoir has a capacity of 500,000 gallons, and the water flows by gravity. The reservoir is open, and the water is not filtered before entering the mains. The cost of construction, four years since, was $60,000; about 100 families, or one half of the community, are supplied from this system. The pressure is 75 pounds per square inch, and 40 hydrants for fire purposes are connected. The supply is ample for all purposes.

WOLFEBOROUGH.

The Wolfeborough Water-works, owned by the town, has a source in Beach pond, in the north-westerly part of

the town, four miles from the village. A reservoir and stand-pipe, for fire purposes, one mile west of the village and, respectively, 210 and 230 feet higher, are connected with the system. There are 57 hydrants, with a pressure of 108 pounds. The capacity of this system is 300,000 gallons. The pond is surrounded by pasture land, with no cultivation along its borders, and the water flows through a fine copper screen only, in entering the mains. The system was completed in 1889, at a cost of $54,854. About 300 families are supplied with this water.

[*Sanitary Analysis of Beach Pond Water.*]

Odorless; color, little yellowish; evaporation, some foamy; residue, little yellowish and small circles; ignition of residue, it blackens; total solids, grains per gallon, 1.3; loss on ignition, grains per gallon, 0.6; hardness, degrees, 0.6; alkalinity, degrees, 0.5; chlorine, grains per gallon, 0.3; free ammonia, part per million, 0.076; albuminoid ammonia, part per million, 0.15; nitric acid, little; nitrous acid, none; poisonous metals, none; iron, trace; sediment, some. Microscopic examination: Diatoms, infusoria, bacteria, various organisms common to fresh water. Oxygen for oxidation, grains per gallon, 0.2543; free carbonic acid, grains per gallon, 2.4244; organic carbonic acid, grains per gallon, 1.0472. This water contains a remarkably small amount of solid matter. It is good water.

(Signed) EDMUND R. ANGELL.

Derry, N. H., August 27, 1889.

WOODSTOCK (NORTH).

This town is contemplating a system of water-works. It is now supplied by a 1½-inch pipe which furnishes water for seven or eight families. The Deer Park Hotel and the Alpine House are supplied by private pipes, and the remaining families take from private wells and springs.

NEW HAMPSHIRE ASSOCIATION OF BOARDS OF HEALTH AND HEALTH OFFICERS.

In August, 1896, the secretary of the state board of health addressed letters to the boards of health of the several cities of the state, asking their opinion as to the advisability of calling together the health authorities of the state for the purpose of forming a permanent organization, in the interests of sanitary progress in New Hampshire. Replies were received from all the cities, and without exception the opinion expressed was in favor of such a movement. In the early part of September, the following circular was issued:

STATE OF NEW HAMPSHIRE.

CONFERENCE OF BOARDS OF HEALTH AND HEALTH OFFICERS,

TO BE HELD AT

Concord, N. H., October 14, 1896, at 11 o'clock a. m.

OFFICE OF THE STATE BOARD OF HEALTH,

September 9, 1896.

To Local Boards of Health and Health Officers:

There will be a meeting of the local boards of health and health officers of New Hampshire, at the time and place above stated, for the purpose of effecting a permanent state organization, in the interests of the executive work of health officers and the public health generally.

The importance of organization among the professions, sciences, trades, and occupations, for the promotion of the interests of the same, is witnessed on all sides. Nothing else is so effective in the accomplishment of a great purpose as coöperation and organization, and in no direc-

tion has this fact been more strongly emphasized than in public health work, as is exhibited in what has already been done by national, state, and local sanitary organizations.

We now propose to organize in New Hampshire a state association of health officers, under such plan as may be determined at the meeting now called. At the same time, papers on various public health subjects will be read, and time will be given to the discussion of matters pertaining to the work of town and city boards of health. We believe that a meeting of this kind will be of material benefit to every health officer in the state, and to which all are invited.

We would respectfully ask each and every local board of health in the state to send one or more delegates to this meeting. The Boston & Maine Railroad has granted convention rates from all stations in New Hampshire at which tickets are sold. A programme of the meeting, together with other details, will be sent to all boards of health some ten days prior to the meeting.

Very truly yours,

Irving A. Watson

Secretary.

The final announcement of the meeting, together with the programme, was issued September 29, and was as follows:

STATE OF NEW HAMPSHIRE.

A conference of boards of health and health officers will be held at Concord, N. H., October 14, 1896, at 11 a. m., in the senate chamber, state house, under the auspices of the state board of health.

In accordance with previous notice, a meeting of members of boards of health and health officers will be held at the time and place above stated.

PROGRAMME.

FIRST SESSION, 11 O'CLOCK A. M.

1. Calling meeting to order.
2. Address of welcome, Dr. Granville P. Conn, Concord, N. H., *President State Board of Health.*
3. Temporary organization.
4. Appointment of a committee to report plan of permanent organization.

5. Paper—Impediments to Sanitation,
Dr. D. M. Currier, Newport, N. H.
6. Discussion—Obstacles against which Health Officers have to Contend, Dr. George Cook, Concord, N. H.
7. General Discussion.

SECOND SESSION, 2:30 O'CLOCK P. M.

8. Report of Committee on Permanent Organization.
9. Paper—Words, Wise and Otherwise, upon Modern Sanitation,
Dr. C. S. Collins, Nashua, N. H.,
Member State Board of Health.
10. Discussion.
11. Paper—Some of the Rights and Duties of Local Boards of Health,
Dr. Irving A. Watson, Concord, N. H.,
Secretary State Board of Health.
12. Discussion.
13.—Paper—Relations of State and Local Boards of Health to Each Other and to the People,
Dr. Samuel W. Abbott, Boston, Mass.,
Secretary Massachusetts State Board of Health.
14. Discussion.

THIRD SESSION, 7:30 O'CLOCK P. M.

15. Paper—Sewerage and Sewage, Prof. William T. Smith, M. D.,
Dartmouth Medical College, Hanover, N. H.
16. Discussion.
17. Paper—A Plea for a Sanitary Marriage and Home,
Dr. C. W. Downing, Manchester, N. H.,
President Board of Health.
18. Discussion.
19. Paper—The Prevention of Infantile Diseases,
Dr. D. E. Sullivan, Concord, N. H.,
Member Board of Health.
20. Discussion.
21. Paper—Some Remarks on Isolation and Disinfection,
Dr. Irving A. Watson,
Secretary State Board of Health.
22. Discussion.
23. Miscellaneous Business.
24. Adjournment.

RAILROAD RATES.

Persons attending this meeting can take advantage of Concord Trade Week rates, to wit: One cent a mile from all stations in the state. This offers an opportunity to attend the meeting at exceedingly low rates.

The value and importance of a conference meeting like the one herewith called ought to commend itself to every member of a board of health and to every health officer in the state. It is the earnest desire of the State Board of Health that every such person will attend the meeting, and take such part in the discussions as opportunity may present. The chief object of the conference is to further public health interests, through instruction, encouragement, and coöperation in matters pertaining to executive and educational sanitary work in each and every town and city in the state.

We believe that all health officers and members of boards of health will be justified in charging the cost of attendance as a legitimate expense incurred in the line of official duty.

Per order,

IRVING A. WATSON,

Secretary State Board of Health.

Concord, N. H., September 29, 1896.

MORNING SESSION.

The meeting was called to order at 11 o'clock a. m., by Dr. Irving A. Watson, in the Senate Chamber.

ADDRESS OF WELCOME

BY GRANVILLE P. CONN, M. D., PRESIDENT STATE BOARD OF HEALTH, CONCORD.

In behalf of the state board of health it is a great pleasure for me to welcome so many representatives of local health authorities. In calling you together for a conference we sincerely hope to receive encouragement in our work, and we trust you will allow us to expect that you will receive hints and suggestions regarding your duties as health officers. Associated effort in matters connected with hygiene seems to be a necessity, for the public are interested in every move calculated to improve the health, prosperity, and

intellectual conditions of the people. The individual worker is a power, each in his own circle, but a combination of such workers associated on a common basis, and receiving inspiration from each other to achieve a common end, becomes well nigh invincible. Good results will follow and in good time due recognition will be accorded the humanitarian efforts of the disciples of Hygeia, who are oftentimes compelled to labor for a time with but little or no recompense.

An old English author once remarked that "the wisdom of the law is greater than the wisdom of any one man." In like manner we may confidently assume that the wisdom of medicine as it is embodied in the collective learning and knowledge of many physicians in council, is far greater than that which any one individual can possess.

As it is in law and medicine, so will it prove in sanitation; for the collective information and experience of these local health boards, when compiled and systematically arranged for future reference, will undoubtedly prove a valuable auxiliary to the health department of the state, and afford much assistance to the health authorities of towns and cities.

It is to be hoped that every local board of health in the state will be represented in this conference, and that each and every one will be heard on some topic which is of interest to the board on which he serves. Let us strive to bring out the experience that has stood the test of time and therefore is worthy of acceptation. The different cities and towns of our state are constantly meeting with perplexing questions, or engineering problems that are difficult to solve, and many times the local health officer wonders if there is not on record some precedent to which he can turn for information and relief.

Now if we bring these problems together for discussion, and turn upon these vexatious questions the combined scientific acumen and experience of these health officers, we may confidently expect that many of these difficulties will fade away under the light of a searching investigation, while truth and prosperity will triumph over doubt and uncertainty. Let us confer and reason together, aiming to bring out the truth and such ultimate hygienic conditions as will render robust health possible as well as a popular sentiment in favor of state medicine.

Throughout the length and breadth of our commonwealth, state and federal associations have been organized that have had a great influence in the popular education and

wealth, state and federal associations have been organized in the formation of public opinion and now the people are demanding of our health boards protection from infectious and contagious diseases. To a certain extent this may be accomplished by the associated labor of all local and state officers working in harmony and with entire confidence that no one will evade or shirk the responsibility of his office, and that he is not indifferent because ignorant of the duties he is expected to perform. It is true that to fulfil the conditions requires those sterling characteristics of manhood that would make themselves felt in any vocation, yet in this period of enlightened civilization such characteristics are to be found, and whenever one without these characteristics unfortunately finds himself appointed to an office, that not infrequently brings him face to face with small-pox or some other contagious disease of such malignant nature that the public demand the protective power of the health officer, he will not "stand upon the order of his going"—"but will step down and out" while the public will find the true health officer, who having neither fear, favoritism, or an overweening ambition to serve his country in politics, will proceed to administer and execute the statutory laws of the state governing epidemics and contagious diseases, and will also educate the public to regard the natural laws of health and the rules and regulations necessary to be observed when epidemic influences are to be stamped out.

Gentlemen, in doing this you have a great work to perform, and in associate effort you can the better prepare yourselves for the exacting duties of the office. You may not always think alike upon questions concerning the welfare of the public health, yet I suspect it is not altogether an evil that people have honest differences of opinion, for discussions may be conducted in such a manner as to be fruitful sources of mental activity.

Sanitary work, like other associate and closely united labor, will always accomplish results that would be unattainable by personal effort alone. The occasional meeting of an association of sanitarians has many advantages, for minds like metals cannot come in contact with each other without receiving some form of an impression: the more forcible the contact, the more vividly the imprint will appear. Mental attrition, like the burnishing of metals, develops all the latent power of the brain, sharpens every faculty, and quickens the understanding; therefore comprehension and perception are improved; questions that seem to involve

principles that are dim and overshadowed by the mists of bigotry, become bright and clear; the outlook is enlarged, possibilities expand; and superstition and intolerance will find little or no sympathy in the minds of those educated in hygiene, and whose training has been in the work of a zealous but faithful and conservative health officer.

I congratulate you on the fact that you have the full measure of the confidence of the people where you reside, and enjoy that reputation for probity, good judgment, and true conservatism, which undoubtedly brought about your appointment as a counselor on matters pertaining to the health and prosperity of the people of the town or city you represent.

Once more I welcome you to this conference and invite every representative of a health board to participate in the work of the meeting.

By unanimous vote Dr. George Cook was elected temporary chairman.

Dr. C. W. Downing was elected temporary secretary of the meeting.

Drs. Watson, Pope, and Houghton were appointed a committee to report upon a plan of permanent organization.

IMPEDIMENTS TO SANITATION.

BY D. M. CURRIER, M. D., NEWPORT.

What I shall say in this paper will be largely the result of personal observation and experience as a health officer, and as a practitioner of medicine in a town of some three thousand inhabitants, and any suggestions that I may offer will be the outgrowth of the same observation and experience. I claim nothing unique or strange in this but presume my experience has been similar to that of hundreds of others in like position. That there is much that stands in the way of sanitary progress, much that ought not and no need to stand there, will not be questioned by any one who has given sanitation anything more than a passing thought. A great obstacle that public health officers have to combat is the ignorance of the community they are seeking to protect; and out of which ignorance grows all manner of opposition to the extablishment of sanitary reform. Individuals who are intelligent in regard to all other subjects are lamentably ignorant in regard to what should be done to keep them-

selves and their neighbors in the best state of health or to control an epidemic when once it has broken out in their midst. Not understanding or careless in regard to the importance of doing certain things for the promotion of the public health they will oppose them or be indifferent about carrying out any order from the health authorities. For instance a general order was issued in the spring to have all rubbish and garbage heaps removed from back of business blocks and dwelling houses by a certain date.

Some of the largest real estate owners in town after making a superficial attempt at removing the offensive accumulation met the health board with a flat refusal to do more; saying, that they would legally meet any farther attempts to oblige them to render the back yards to their business places and tenement houses freer from the decomposing and unhealthy debris, apparently not knowing that the statutes gave the board ample authority to oblige them so to do. Not appreciating the importance of the work done by the health officers such men naturally object to the expense incurred. To the true physician or philanthropist it is a pleasure to render the community healthier and happier and thereby more prosperous. The esprit de corps of every worthy member of the medical profession will enable him to sit contentedly in his office reading his favorite literature if he knows the community around him is enjoying the blessings of health, and more especially if he has the inner consciousness that these blessings have come through his own individual efforts. It will, however, dampen his zeal in future work of the kind if the town or city refuses to pay for the services rendered or only pays for them after severe and protracted criticism of every charge that is made.

The service that prevents and turns away the misfortune of sickness is tenfold more valuable to the state than any service that can be rendered toward restoring those who are already prostrated by sickness, and for the success of sanitary work such service should be recognized and paid for as liberally as ordinary professional service when rendered by those who have devoted their time and given much thought and study to the subject.

In a recent epidemic of small-pox a certain board of health gave their time and devoted their best energy toward controlling the spread of the disease. Three cases had already occurred and the fourth was far advanced in the vesicular stage when it was accidentally discovered by a neighbor suggesting to the board that he thought it might

be a case of small-pox,—the attending physician not having reported the cases. No pains were spared and ignoring all danger to themselves and their families, the health officers threw themselves into the breach to protect the community from the farther spread of the disease. In this they were successful, not another case appearing. Only ordinary professional charges were made, but at a public gathering of the town the board of health was held up to public criticism, shame, and ridicule for the charges they had made, and at the earliest possible moment were ousted from their office. It needs but little reflection to comprehend that the pittance paid could bear no relation to the amount it would have cost the town if a general epidemic had occurred.

Perhaps there is nothing that causes so much chronic invalidism as the daily and constant use of impure drinking water; yet you might as well kick a man's dog as to tell him his well water is contaminated. He will tell you it is sparkling, clear, and cool; that it is called the best water in town; that everyone is gratified when they can get a drink of it; that his father dug the well seventy-five years before; that they have always drank of it and no one has been made sick by it, and perhaps before leaving you he will pour into your patient ear a series of complaints from which he or some member of his family is suffering which you are confident are caused by that same drinking water. Many think that old wells like old wines are improved by age; little thinking that when situated near buildings the family filth which must be generated in order to live, has for scores of years been absorbed by the soil in its immediate vicinity. Both rural and municipal communities should be taught that no vigilance is too great to guard their water supply from possible pollution.

Immediately connected with the water supply is the sewarage of a town. When pressing the importance of it the independence of opulence said to the common herd, "We have a sewer of our own and have paid for it; let others do the same or else do as you have for the last fifty years", not considering that conditions change; that what was safe for our forefathers to do is not always safe for the present generation.

It would be a great help to sanitation if the majority of the committee having in charge the erection of public buildings were intelligent sanitarians. Towns and municipalities would do well to consider this. A few years back we were urging upon the building committee of a rural schoolhouse

the importance of making some provisions for proper ventilation and lighting which would require but slight additional expense, when we were met by the remark, "Perhaps we better put all the appropriation into ventilation and heating."

One day after delivering their milk at the railroad station a group of farmers were standing upon the corner of the street discussing the law requiring all herds of cows furnishing milk for the public supply to be examined for tuberculosis, when the following remark was overheard, probably prompted by the idea that they might lose some of their cows: "If any one comes to my place to test my herd they will be met with a shot gun." O short-sighted avarice! Who would be more benefited than that same farmer himself by the inspection?

If his herd was not infected no harm would have occurred to him, whereas if it had been, who had a greater interest in knowing it than the man who was probably daily supplying the diseased milk to his own household, thus exposing the loved ones of his own family to the most dangerous and fatal disease that is now affecting the human race?

It is with regret that I have to call attention to another impediment to sanitation, viz., the indifference of some members of the medical profession in cooperating with the health officers in restraining epidemics or reporting cases of a contagious nature. Some physicians may be averse to having a health officer interfere in a sanitary way with their patients, thinking perhaps that some disadvantage might accrue to them. This ought not so to be. As long as the attending physician is conforming to the law, the health officer should be an aid to his efforts in caring for his patients. Any health officer who would use his official position to lessen the confidence of any one in his physician or in any way embarrass that physician in his professional labors, is not worthy of the position he holds. Indeed, no words of mine are sufficient to express my disapprobation of such conduct. On the other hand, a physician who would conceal a dangerous and contagious disease and in defiance of law and public safety heedlessly or willfully neglect to report the same, should receive just as severe condemnation.

In the epidemic of small-pox referred to above, the attending physician diagnosed the case as chicken pox and yet when some member of the family suggested that it might be small-pox he very significantly cautioned them not to speak of it as they would be quarantined for six weeks. In

an adjoining town the same defiance of law and resulting epidemic depleted the town treasury over $6,000, without reckoning individual losses and depression to business.

Another illustration: For six months there had been sporadic cases of scarlatina in a community. As spring advanced a whole family was prostrated by what the attending physician diagnosed as rosela. The father was so very sick that friends became alarmed and called the attention of the health officers to the case. Upon investigation it was pronounced by the four physicians who were called in to be a typical and severe case of scarlatina. The mother was so far recovered as just to be around. In the stage of active desquamation she was on the street visiting stores and shops to procure the necessary comforts for the family. As good luck would have it, only one case was traced to this extreme exposure.

If I may be allowed the suggestion, I would say that no politics should enter into the selection of health officers. It should be an appointive office either by the state board or by the selectmen of the various towns. The tenure of office should be for three years unless removed for cause. The salary should be fixed by law according to the population under their charge. The salary should be such as would command the attention of the best men for the place. Men who are above suspicion, bold men who will fearlessly do their duty, whose favor cannot be purchased by the money or the smiles of the rich, and who will regard the rights of the humblest and poorest. Having secured such men, let the community give them its hearty support and we may expect the best results that it is possible to attain.

The key, however, to the fortress that looms up in the pathway of sanitary progress is the indifference of the public in times of general health when, too often, little thought is given to it. Those who have made public health a study and are standing on the eminence that enables them to see the approach of the enemy, can understand and in a degree measure the danger that threatens; while the throng who are rushing along in the various vocations of life give no heed to the handwriting on the wall or will not listen to the voice of warning uttered by those who through the aid of science can interpret its meaning. Some indeed are stopping to listen; many more are interested than was the case a few years back, thanks to the efforts that have been made to teach them, but the work of education and enlightening the common mind must go on if one of the greatest barriers

to sanitary progress is to be removed. Mankind must understand that under some circumstances disease should be considered a crime which subjects the one afflicted to social ostracism forever afterwards. If "the idea ever becomes a popular one that by a circumspect walk and conversation man may avoid disease even as he does the county jail and whipping post" then indeed will the pathway of the health officer be strewn with flowers and his couch be a bed of roses.

DISCUSSION.

Dr. George Cook: For seven years I was health officer in Concord, and from my experience in that position and in country towns I know something of the obstacles with which health officers have to contend, and the first is the lack of general public support. And the reason for this apathy on the part of the people is that they have not been educated in the direction of sanitation. The incident mentioned by Dr. Currier, where he spoke to a man about his well, is generally found to be true; I have often met with the same remark. In country towns I have more fear of the well-water than any other condition met with, because I believe that in a majority of cases it is unfit to drink. I believe that water is a great sanitary agent, and no doubt there is not enough of it used, both inside and outside of the body, as a flusher and cleanser of the system. That the people are not educated in the requirements of sanitation is due largely to the health officers themselves. Health officers are but human, and have to deal with things as they find them, and too often allow their own personality to appear. In country towns complaints of nuisances often follow as a sequence to some neighborhood dispute, and there is generally some bad blood aroused before the matter comes to the health officer. Generally they have stood it as long as they could, and then sent for the health officer, and he cannot help putting in his own personality. Such cases are very difficult to deal with, but the health officer should determine upon the merits of the case, and make the parties understand that the decision will be unbiased and for the good of all. Some

men have a faculty for smoothing matters over and making it apparent that they are discharging their duties impartially; it does not always require a great amount of sanitary knowledge to do this, but it does require much common sense and knowledge of human nature. It is essential to keep cool and go forward with the work in hand, not with a sense of fearlessness, because that is the nature of bravado, but do the business kindly and with the interests of all concerned in mind. I know that these feuds between neighbors, because of pig-pens, sink drains, etc., last for years and years, and have been known to affect health officers as well. When I was health officer in Concord I thought I had managed one case pretty well. I talked with the man and he agreed to have his sink drain connected with the sewer. After I left him he talked with some one else, and concluded that he would not do it. Finally I had to get the city marshal to serve a notice on him, and then he was obliged to make the proper connection with the sewer—but a few years after that I ran for a certain office, and that man would not vote for me.

If the health officer can educate his people to the idea that he is helping them personally, those that are complained of, that he does not come to serve notice on them to get rid of them in a judicial sense, but impress upon them that it is to be a benefit to them personally, then he has helped to educate that man or that family. It requires much tact and steadfastness of purpose to do this and still carry on the work that it is intended to accomplish.

I find that in country towns many physicians decline to serve as health officers, because so much trouble and hard feeling results that their professional business suffers, and this is often true. An intelligent layman should make a competent health officer, if he has other necessary qualifications. When a case is reported to him as small-pox, or scarlet fever, or diphtheria, I do not understand that it is the province of the health officer to doubt that diagnosis. When a disease is reported to a health officer, it is his duty

to care for it in accordance with that report, no matter what the neighbors may say. If a case is reported to him as scarlet fever, he has done his part when he treats it as such. I was intending to talk a little upon isolation, but I understand that Dr. Watson is to speak upon that subject.

Dr. Watson: I am not going to discuss that question today.

Dr. Cook: When a case is reported as scarlet fever, there are certain rules laid down for the guidance of the health officer, emanating from the state board of health: For instance, for a certain number of weeks the patient and attendants must be isolated. If that patient can be isolated, with his attendants, in some part of the house, without isolating the whole household, it simplifies the whole matter. It is an expensive matter to quarantine a whole house and family, thus keeping the head of the family from his work, and that is one reason why towns object to paying the bills, because health officers want to be on the safe side, and quarantine the whole house. In some families it is absolutely necessary to do this, while in others it is not, and where can the line be drawn? Where the family can be relied upon, if the child with scarlet fever, for instance, and the attendants are isolated in one room, or a suite of rooms, the rest of the family may go in and out from the remainder of the house as they please without danger to others. But this can be done only where you have confidence that directions will be strictly followed. In another family perhaps this cannot, for various reasons, be done. This is a very delicate and important matter to handle, and to explain satisfactorily why it is necessary to quarantine the whole house in some cases and not in others.

The rule laid down by health authorities and co-operated in by boards of education in regard to the length of time children shall be restrained from attending school after certain contagious diseases, is on an average of about forty days for diphtheria and scarlet fever, and for measles about fifteen days. This is the general scale. But whatever rule has been laid down by the health officer has been based

upon experience, and is considered to be the safest plan, and for this reason when it is possible to isolate a patient in a single room or two in a house, and not restrict the whole family, no great inconvenience results, and the head of the family may perform his usual avocation, while the greatest safeguard is vouchsafed the public.

Another point that I should like to speak of in connection with isolation applies more particularly to the physician. The patient is ready to go when he is well—and that means when he is entirely well; when the stage of desquamation in scarlet fever is over, the bacilli are free from the throat in diphtheria, and when the scabs are all off in small-pox, and although the board of health says this requires a certain number of days, it is the physician's duty to restrain the patient until he is free from the disease, be it a longer or shorter time. You may have to keep him longer than the specified time, while, on the other hand, he may be discharged sooner. This sometimes happens, but it is best to be on the safe side. The hearty co-operation of the physician with the board of health is necessary for the successful execution of sanitary work. I am glad to say that in my experience there has been a very great improvement in these matters. There are some people in every town acting as a nucleus of support for the health officer, and the majority of the physicians are willing to support and help him in his work. Let the individual work go on, and do not despair if all are not converted at once. In time we shall get all the people to understand that we are working together to prevent disease and to increase longevity and human happiness.

Dr. W. R. Sanders, Derry: I am a member of the board of health of Derry, and have some perplexing questions to deal with. We were recently notified of two cases of scarlet fever, and I went to the house prepared to post the scarlet fever card. I found a girl, fourteen years old, seated at the window with a flannel about her neck; the other patient, a boy, came to the door. The mother came to the door also

and said, "Doctor, won't you look and see if this is scarlet fever that the children have?" I told her that I had nothing whatever to do with the diagnosis of the cases, that it was none of my affairs, and that it was simply my business to placard the house, as the disease had been reported to me as scarlet fever. I went to another house where a case was reported, but after knocking no one came to the door. Finally I saw a woman and five children coming down the street. I said, "Is this Mrs. ———?" and she replied that it was. I then asked her if there was a case of scarlet fever in the house. She said there was not. I told her that I had received a report of a case there. She said, "Well, there isn't," and she glared at me and shook her fist. I said, "But has not this girl (indicating one with her) had a sore throat?" She replied, "Yes, she has, but she is subject to sore throat, has it two or three times a year. There she is, you can look at her." She said the girl had not been sick since last week, Thursday; that she had not seen a physician for eight days. I kept the children out of school a week, but I did not post the house. I kept the children at home until the following Wednesday, as a precautionary measure, and because the neighbors demanded it. I think if I had posted the house I should not have escaped with my life.

Dr. Conn, Concord: Mr. President, as a member of the state board of health I feel that the remarks of yourself and Dr. Currier are certainly in the right direction. This is a matter which we should consider and which is of importance to every health officer in the state, as well as to every one who in the future may be a health officer. The condition described by Dr. Sanders is one that not infrequently occurs, and it is surprising that the profession will place themselves in the position they sometimes do. A physician who had reported a case of scarlet fever six or seven days after he had visited the case, was really reporting it from being informed by friends of the family rather than from exact knowledge. I do not know that the lady referred to was to be blamed because she exhibited some pugilistic qualities,

and I have a good deal of respect for Dr. Sanders in that he withdrew from placarding the house, as he might have fared worse. At all events, the course he took ought to have satisfied the neighbors, and if his instructions were carried out, was amply sufficient. Keeping the children in the house was all that could be expected, but it would seem that they were like a flock of chickens, and were very likely at the house first mentioned before he saw them coming down the road. If he succeeded in isolating them to the extent that they remained upon their own premises, it was all that could be expected. The fault was that the physician, if he believed the disease to be scarlet fever, should have reported it to the board of health the same day he discovered it, instead of six or seven days after. It is only in educating the public that we can bring about a better state of affairs.

W. K. Robbins, Manchester. Gentlemen: We have some cases that are exceedingly difficult to handle, and we feel that we need the advice and encouragement of older and more experienced heads. One case comes to my mind at this time: A case of scarlet fever was reported to the board by a physician, and in accordance with that report we placarded the house. In less than a week we received a card dismissing the case, and the family requested that the placard be removed. There had not been sufficient time for desquamation, and it was a puzzling question what to do. We usually govern ourselves in accordance with the physician's diagnosis, yet in this case it had not been a week between the time he first reported the case and the receipt of the card announcing its dismissal. Shall we take him at his first word? or his second? If it was not scarlet fever at all, he has done the family an injustice by reporting it as such, and if he made an error, it seems to me he should change his diagnosis and report the same to us. In another instance we received a report of a case of scarlet fever from a physician, and proceeded to placard the house. Immediately came a protest that the disease was not scarlet fever. The only reply the board of health made was that the case

had been reported as such and the house must be placarded. They said that another physician had been called, and he declared that it was not scarlet fever. We informed the family that the second physician had made no report to the board of health, and that the card must remain until the preponderance of evidence showed that scarlet fever did not exist on the premises. Finally we had a note from the second physician, stating that the disease in question was not scarlet fever—and in all probability it was difficult to say whether it was or was not at that time. One physician said it was; the other said it was not, and there being an equality of evidence we said the card must remain. They called a third physician for consultation, and finally concluded that there was no scarlet fever. There now being a preponderance of evidence that the case was not scarlet fever, we removed the card—whether right or wrong, we were not particularly certain, but fortunately no other cases were traceable to that case. What can health officers do in such cases? We use all the tact and moral suasion possible to influence physicians to report their cases promptly, and give them credit for doing it; but when they neglect this duty, it is puzzling to know what to do in many cases. Our experiences are doubtless much like those of other cities. We often find ourselves involved in neighborhood quarrels. It is almost impossible to convince people that they are taking steps to do themselves injury. They seem to feel that if they are willing to take the risk of all sorts of nuisances, others ought to be willing to take the same risk. We have some difficulty in dealing with contagious diseases among the poorer classes, especially in the corporation boarding houses. A single case of scarlet fever sometimes makes it necessary to quarantine a whole block, if allowed to remain in the infected house. We try to induce these cases to be removed to the pest-house, so-called, being a house that was fitted up in the time of small-pox, and we sometimes prevail upon mothers to go with their children, sick with scarlet fever or diphtheria, to this house and be

treated there, thus relieving the block or boarding house from quarantine. We hope in time to have a hospital, or contagious ward, within convenient distance and suitably fitted for the treatment of contagious diseases.

Herbert S. Clough, Manchester. Gentlemen: I want to ask what course should be taken in regard to reporting second and third cases of a contagious disease. In carrying out such measures as we are told to do as sanitary inspectors, we often find that one or more cases follow the initial case of contagious disease in a family; that while the first case has been properly reported by the physician, the subsequent cases have not been reported. Sometimes, too, the diagnosis is changed, or the physician is changed and the second physician fails to report the case. The law requires that physicians shall report every case of a contagious or infectious disease coming under their care. I would like to ask what health officers of other towns do when physicians fail to report subsequent cases.

Dr. Irving A. Watson, Concord. Gentlemen: I am able, perhaps, to answer a few of the inquiries made, both by the gentleman from Manchester and by Mr. Davis. The law requiring physicians to report certain diseases is not a regulation made by the state board of health, but is a part of the Public Statutes. The law reads: "It shall be the duty of every physician who attends upon any person infected with the small-pox, the malignant cholera, diphtheria, scarlet fever, or any other malignant pestilential disease, to immediately report the same to the health officers or selectmen of the town; and if any physician shall neglect so to do he shall forfeit the sum of one hundred dollars, to be recovered by such health officers or selectmen in the name of the town." That is the law so far as the physician is concerned, and I may say that in one city in this state an attempt was made to enforce the law. A physician failed to report a case; was brought into police court and fined. He appealed to the supreme court, but finally settled. There has been no neglect to report on the part of the physicians of that city

since that time; they all know that the health officer means business. A physician should respect the law as much as any other citizen, and the health officer should not hesitate to enforce the law upon all alike; if the law is not right, let it be repealed.

In regard to measles, as referred to by the gentleman from Laconia, every physician and most health officers know that it is a disease difficult to handle from a sanitary standpoint, for the reason that it is infectious in its earlier stages. The state board of health has made a single rule to govern this disease, as follows :"Any person having the measles, however mild the case may be, and all persons in a family where measles exist, except those who have had the disease, are forbidden to attend school or any public or private gathering, or to mingle with persons who have not had the disease. Persons who have not had measles are forbidden from entering the premises." This is all the rule or regulation made by the state board of health concerning this disease. That does not isolate or quarantine the entire family. It quarantines the children of the family who have not had the disease and prohibits them from attending school. If there are children in the family who have had the disease, they are not restrained in any way. This rule is based upon the experience of physicians and sanitarians in this and other states, and it seems to us to be about all that can be done at present in the direction of the control of measles.

In regard to typhoid fever, a regulation was issued by the state board of health some three or four years ago, requiring houses containing a case of this disease to be placarded, as in certain diseases, not because the disease is considered to be infectious to the degree that scarlet fever and diphtheria are, but because it was thought best that the community should be warned of the existence of typhoid fever in the premises, that they might refrain from entering unless it was necessary. The state board of health has thought it best to leave it to the option of the local board of health whether to placard houses containing

typhoid fever or not. The very presence of typhoid fever in a locality should be sufficient to stimulate to discover and stamp out, if possible, the local conditions that produced the disease. If the sanitary condition of the house were such as to lead the health officer to believe that the source of the disease was right there, he might deem it advisable to placard the house and prohibit any one from entering. This matter is left to the option of the local board of health.

Mr. Herbert S. Clough, Manchester. Gentlemen: I realize perfectly well that the Statutes provide for the reporting of diseases; but the state board of health issued, under the approval of John Smith, governor, a series of articles, and the first of those articles reads: "Every physician practising medicine in this state shall report at once to the local board of health every case of cholera, small-pox, typhus fever, yellow fever, diphtheria, membranous croup, scarlet fever, typhoid fever, and measles, coming under his care or observation." In another article the penalty is fixed. Article 12 reads: "Any person or corporation violating the rules and regulations issued by the state board of health, shall be subject to a fine of not more than two hundred dollars, or be imprisoned not more than six months, or both; and it shall be the duty of any person to whom a knowledge of such violation may come, to notify the state board of health." Now that article covers every contagious disease that we have anything to do with, while the Statutes fail to cover all these diseases. Do you call that good law? and if it is good law, how can it be put in force?

Dr. Watson. Mr. President: Those regulations, which were adopted by the approval of the governor, are based upon a quarantine law passed by the preceding legislature, which authorized the state board of health to make such rules and regulations as it deemed best. These rules and regulations were issued under authority of that law, and were approved by the governor. In consultation with the attorney-general upon the matter, he held the opinion that that part of the regulation which imposes a fine of not more

than two hundred dollars, etc., was good law, inasmuch as the regulations were based upon the quarantine law, which imposes a like penalty for a violation of that law. I suppose the way to proceed, in case of the violation of the law, would be through the court in the ordinary manner, or place the case in the hands of the county solicitor or attorney-general.

Dr. J. T. Greeley, Nashua. Mr. President, Gentlemen: With reference to medical practice, this state is at a large expense every year to accumulate statistics. These statistics, in order to be of any value, must be accurate. The board of health of Nashua, and I do not know but it is the same in other parts of the state, has been obliged to refuse to accept certain certificates of death, which were very peculiar, and I doubt very much if they would add anything to the scientific knowledge which the state board of health is accumulating from year to year. One reason for this state of affairs lies in the fact that our city, being somewhat of a railroad centre, is more or less over-run with persons who are attempting to practise medicine with no medical or preparatory education whatever. I recall one or two peculiar terms which have been given on the death certificate as the cause of death. In one instance the patient was said to have died of a "complication of diseases," and I scarcely see how that can be any aid to scientific knowledge. Another death was caused by "hydro-peritoneum." It seems to me the only way to bring about an improvement in these matters, is to have a little legislation that shall raise the standard of the medical profession in this state, and under which only such persons shall be allowed to furnish certificates of death as are, by virtue of their education, capable of so doing. Nearly all the states in the Union have taken some such steps, and as a result all the quacks have been driven from those states to our own, and Nashua receives more than her due proportion of that class of practitioners.

Mr. Morrison, of Haverhill. Mr. President: I represent

a section of the state lying along the border of Vermont, and the physicians from the adjoining towns in that state, as well as from other towns in our state, frequently attend cases in Haverhill. I succeeded Dr. Watson as health officer, he having held the office three years, and have carried on the work as best I knew how. I have taken the law as it has been handed to me, and have fought my own battles. There are some ten or twelve physicians who run into our town to practice, and from some of them it is almost impossible to get death certificates as well as from some in my own village; from two of the latter especially it is very difficult to get certificates. Now as to the question of scarlet fever, have I done my duty? Last spring I saw an item in the paper, stating that a case of scarlet fever had existed in the centre of the town. I made inquiries and found a case that the neighbors said was scarlet fever, but it had not been reported by any physician. I immediately drove to North Haverhill and found the physician who was attending the case, and he agreed to meet me at the house the next morning. I quarantined the family. This same physician had treated two other cases of scarlet fever in the same school district, and had not reported either of them. I found that the disease had been carried from one family to another. In a few days I was telegraphed to go to the county buildings, and I found a case there; this was Thursday night, and I went early Friday morning. Everything went well until Monday morning, when I received another telegram to go to the county buildings, as there was another case of scarlet fever. I went and found another case. We had cleared several rooms in the top of the building for the insane, for a hospital, and we did everything possible for the cases. One death occurred, and one more case appeared. I tried to find out the cause of the disease. I learned that a boy had been brought there from Rumney the 17th of March, and knowing that the disease was in Rumney, I went down to Rumney. I saw the overseer of the poor and he said it was impossible for

the boy to carry it to the county buildings. This boy had lived on the same street where there were two houses under quarantine from scarlet fever. He had been out of the house but very little during the whole winter, but his mother did washing. Just sixteen days after the boy was taken to the county buildings the disease broke out. (Not the boy but a little girl). Afterwards the disease broke out in another part of the town. The first case was traced to Warren, and it was simply reported there as mumps, but they gave the symptoms and it proved to be scarlet fever. Then the disease was carried to Haverhill. At the north part of the town the physicians do not report contagious diseases. There had never been any quarantine of any disease in my part of the town until I took the office except diphtheria had been quarantined by Dr. Watson, and he was the only physician who ever quarantined diphtheria in our town, and I have tried to carry out the work he began. After the scarlet fever was cleaned up a petition was handed to the selectmen, asking for my removal. I met one of the selectmen one day and he told me he had sent me a letter. I went home and there found the letter. It was an invitation for me to resign my office as health officer. I looked it over, and thought to myself, "I don't see into that." I drove to East Haverhill to see the selectman, and asked him what it meant. He said that a petition with twenty-six names had been handed to the board, asking for my removal, and he thought that rather than be removed I would resign, and then they would publish it in the papers that I had resigned my office. I told him that I couldn't see it in that light; that if there was any reason for my removal, they could remove me, but that I should not resign—not that night; that I proposed to stand my ground. There was nothing more said about my removal, and I have been going on with the work. Right across the town line in Piermont, they pay no regard whatever to quarantine there. One physician is now attending a typhoid fever case just across the line. He reported the case Saturday. On

Sunday morning the selectmen went to the town clerk to know what to do, but there has been nothing done to the house—this I know. I found where there had been three cases of scarlet fever in Woodsville that the physician had not reported. In Piermont last year there was a case of typhoid fever in the village; the party got well. A fortnight afterward two young men were taken sick; one left the town; the other died. Nothing was done in either case to prevent the spread of the disease. The odor around the building was bad where the typhoid fever was in Piermont, and I spoke to the selectmen about it, that something ought to be done, and I had half a mind to enter a complaint, but I went away from the place and nothing was done. So it makes it somewhat difficult for me to perform my duty as health officer, and the surrounding towns doing nothing.

Dr. Tristram Rogers, Plymouth. Mr. President and Gentlemen: I am sure the town of Haverhill is to be congratulated on having so excellent a health officer, and I am sure it would have been a great mistake to remove him. In the matter of typhoid fever I would suggest that it is not a disease whose source can always be traced. It might be from the residence or town in which the patient was lying sick, or it might have been contracted in another town, and still it might not manifest itself for a week or ten days, except by a slight indisposition, and so it is sometimes quite difficult to place it. I live in the town of Plymouth where we have very little epidemic of typhoid fever or other disease, on account of having good sanitary conditions. We have good sewers, and nearly all the dwellings are connected with them. We have aqueduct water that is verified from time to time, and as a rule has been all right.

Dr. E. F. Houghton, Rochester. Mr. President: It is evident from the remarks of the several speakers present, that the experience of one is about the same as that of all other members of health boards, in different localities of the state. I was a member of the Board of Health in Claremont for five years, five years its secretary and three years

chairman. I know something of the difficulties and duties of health officers. I have tried the law somewhat, and as reference has been made to the negligence of physicians in reporting contagious diseases, I will give my experience. Last year, as you know, we had an epidemic of small-pox in Claremont. It had existed for forty days before it was know to the health officer, and there had been nine cases, all treated by the same physician. These cases had all been reported to the board of health as measles. On the forty-second day from the first case, the physician who had attended them all reported to me that the four cases he reported the day before as measles he now thought was small-pox, and wished me to go with him to visit them and see if he was right in his diagnosis. Now I believe that the attending physician thought the first case he had was measles but I also believe he knew the second case (child of the first), was small-pox, as also the other cases that succeeded. I tried as an officer of the town to have him punished for his neglect, which was so disastrous to the town. I sought help from the state board of health, but found I could not get much from that quarter, so the local board of health took the case in hand. We brought suit against him, basing our action upon section 3, chapter 110, of the Public Statutes of the state, which provide a forfeiture of one hundred dollars for neglect to report small-pox and other pestilential diseases. The physician was advised by very high legal authority to stand his trial as the law was unconstitutional, but he did not make any defence and paid the town one hundred dollars and costs of suit. There is one point that comes to my mind, and which I found very difficult to handle, which has not been discussed, and that is light cases of scarlet fever, measles, and even diphtheria, that have not been reported to the board of health for the reason that there was no physician in attendance. Among the French population in particular, there are many who do not have any physician at all, unless the sickness is very severe, and thus we often have a focus of contagious disease unlooked

after. Now I would like to inquire, Is it the duty of the board of health to be constantly on the lookout for such cases? I have done it as best I could and during our late epidemic of measles I have found whole families of as many as six children all sick and no physician in attendance.

In regard to another question spoken of by several, What is to be done when the physician makes a mistaken diagnosis? Shall the board act upon the report or confirm the diagnosis before acting? I have always acted upon the report as made. I recall one case when a child was reported sick with diphtheria, and upon my call at the home to place the family in quarantine, I found the child out doors at play. I placarded the house but the father made some objection. I told him he must abide by his physician's report, I could not act against that without a liability to myself. His physician during the day reported that he had made a mistake and I then released the family from quarantine.

There is another matter that I have met with in this connection which has giving me some trouble. Supposing, for instance, that the attending physician reports a case of scarlet fever, and at the end of eight days or perhaps sooner tells the family that the case is fully recovered and there is no contagion, and the family wish the placard removed and to be let out of quarantine. Now there has not been a sufficient length of time in such a case for desquamation to take place. The result is a conflict between the health officer and the attending physician. I have followed as nearly as possible the rules and regulations of the state board of health, and notwithstanding the attending physician has said the case was fully recovered at the end of seven or eight days, I have said, "That makes no difference; you cannot go out until the end of quarantine." I have found it very difficult to maintain quarantine and have on several occasions arrested the parties for breaking out and caused them to pay the fine of ten dollars and costs. At the time of the small-pox epidemic we had to place an officer on guard at

the small-pox hospital to keep the people out. Some thought it was a hotel, and we also had to guard the private houses that were placarded. Many people there were no more afraid of small-pox than I would be of chicken pox.

There seems to be a lack of uniformity in the method of treating contagious diseases in different towns, and it would seem from the remarks of the gentleman from near Haverhill that they have a sort of local option law there. In regard to typhoid fever I never quarantined a house for that disease; I simply placarded the house, thus notifying the public that a case of typhoid fever existed there. I told the family they might come and go as they pleased. I even permitted the children to attend the public schools and with no bad results. In cases of diphtheria and scarlet fever of course we tried to have the quarantine strictly observed. Measles are the most difficult to properly quarantine as they are contagious before the cases are, or can be, reported, so that it is very difficult to control them, and almost useless to try, and the disease is so generally considered of such trifling consequence, and in fact a disease to be desired for children, that parents often try to expose them to the disease, with sometimes very unpleasant results.

I understand fully why physicians oftentimes do not report their cases of contagious diseases, for many families do not wish to be quarantined. They think they can keep the sick one isolated and in fact so they can, and in such cases it might be all right. The trouble is that there are so many more that would not that we cannot very well make a rule work well unless we apply to all alike. I will add just a word in regard to disinfection. I have always given my personal attention to disinfecting for diphtheria and scarlet fever and always at the expense of the town.

Dr. Watson: Mr. President: This discussion has been exceedingly interesting, and as there are subjects coming up this afternoon that are along the same lines, I move that we now adjourn. One word more: As we have a very interesting programme for this afternoon and evening, I

would like to know how many of those here present will remain through the evening session. If it is necessary for quite a number to leave at the close of the afternoon session, I would propose that we make a longer afternoon session and combine the two programmes.

Finding that several would leave at the close of the afternoon session, it was moved and seconded that the adjournment be until 2 o'clock P. M.

AFTERNOON SESSION.

The meeting was called to order by Dr. Cook, at 2 o'clock.

Dr. Watson made a report for the committee on permanent organization, submitting proposed constitution and a list of officers for the ensuing year, which was adopted.

Dr. C. S. Collins presented a paper entitled "Words, Wise and Otherwise, on Modern Sanitation."

WORDS WISE OR OTHERWISE UPON MODERN SANITATION.

BY C. S. COLLINS, M. D., MEMBER STATE BOARD OF HEALTH, NASHUA.

If instead of greeting you with the open hand of good fellowship, and entering upon discussion of matters pertaining to everyday living, I were to read to you a telegram to the effect that an invading army is landing on our coast, and a hostile fleet threatening our harbor defences, what would happen? Your patriotic instinct would be aroused, and as true Americans you would rush from this presence to the service of your country.

Those of us who are physicians, would soon be strutting about camp with the cabalistic insignia of surgeon upon our shoulder straps. Those of you who are not surgeons would seek fame on the bloody field of battle or fortune in ending substitutes. The whole country would be in a state of alarm. Newspapers, journals, and magazines, which did not contain the fullest details, would become obsolete. Patriotism would be on guard at every turn, until the invaders were driven from our shores.

But, gentlemen, when I say to you today that there is an army whose martial tread is never heard, whose musketry is as silent as the shooting star and deadly as the poisoned arrow, encamped in every village and hamlet, and carrying down to death more victims than war and famine, no one becomes frightened, no one rushes to the defence of home and family. And yet you all believe me.

Unless a sudden epidemic of unusual malignity comes into the community, not only the people pay no attention to sanitary precautions, but the public press is content to peddle little nothings about nobodys, never heeding or discussing the great questions of public health, or warning the people of ever present dangers lurking in this place or that.

All the people have so long ignored the insidious microbe that he has become almost a welcomed guest, and when he plucks one after another from our ranks, the chaplain very soothingly recognizes: "Another dispensation of Divine Providence," when as a matter of fact it was a case of every day filth,—a direful monument to the neglect or incapacity of somebody whose duty it was to remove it.

"The first Napoleon," says Dickens, "caused more deaths than all the earthquakes since the days of Noah: the cupidity of shipowners, and the supineness of sailors, have lost more lives and ships than all the storms that ever blew; the filthy state of our towns sends more souls to Hades, than all put together. Plague, pestilence, war, and famine yield to dirt." Dickens spoke wisely according to the knowledge of his generation. Today we fear not so much the dirt, as the microbes that entrench therein,—sending out their deadly shot and shell with ever increasing fatality.

The study of the history of epidemics discloses the grossest ignorance of disease and the causes leading up to it, down to the promulgation of the germ theory. One after another have the germs of malaria, scarlatina, diphtheria, typhus, cholera, yellow fever, etc., been dragged into the light for scientific study, till there is no longer a "germ theory." We know our enemy, his habits, his mode of living and of attack, and not only how to defend ourselves from his assaults, but how to go out into the open and annihilate him. But there is no martial pomp and splendor in nosing about pig-pens, pest holes, and privies, no glory in dying in such a war, and so the microbe lives on!

It is not the province of this paper, if indeed it has a

province, to review the revelations of the microscope as applied to sanitary science, but rather to endeavor to interest you in these things, so that the able presentations of the various branches of this subject, to which you listen today, may arouse in you a more earnest desire to protect your communities from the various preventable diseases. To this end I commend to you a careful study of all the causes of disease. To some of these I briefly allude.

Tuberculosis in cattle. There is one great source of danger which has never received a proper recognition in New Hampshire, although under the watchful care of the cattle commission, of which our honored secretary is a member, as much has been accomplished as the size of the appropriation would warrant. I refer to tuberculosis among cattle. Frequently this disease is found in a herd owned by some farmer who supplies the neighboring city or town with milk.

Without entering upon an elaborate discussion of the great danger of, in this way, carrying tuberculosis to infants, as well as to adults, instances of which have come under my own observation, I wish to say to you, that you should use your best efforts to educate the owners of cattle upon the great advantage of the tuberculin test, giving as it does a clean bill of health, and also to impress upon your representatives in the next legislature, and the governor with his veto, the necessity of appropriating a generous amount of money for the scientific examination of every herd in the state, and the extermination of the disease before it becomes so general as to render eradication impossible.

There is much to be said upon the spread of tuberculosis in other ways than by infected milk and meat. The only one of these upon which I will touch at this time is the disgusting habit of spitting in public places. It is a fact that the germs released from a single drop of dried sputum are capable of infecting a whole city if they chance to fall upon fertile soil. While it is true that tuberculosis is contagious, it is also true that the danger arising from the presence of consumptives in a community may be limited by the passage of laws against spitting in public places. Such laws are not only a restraint, but their proper enforcement is a kind of education of the public, not only in good manners, but in the line of self-preservation. Experiments have shown that wherever the sputa of consumptives is collected and properly disposed of, there is no danger of contagion.

There is, therefore, less danger from contagion at resorts where these facts are known, than in public settlements where consumptives walk abroad scattering the seeds of death as they go. The day is not far distant when states will be compelled to take up this whole question, and provide sanitaria or other means of preventing the ravages of this horrible disease.

Plumbers. Another great menace to health, requiring your attention and careful study, is found in faulty and unscientific plumbing. This is especially true of contract work in schoolhouses and other public buildings. There should be a little legislation asked for along this line.

In New Hampshire though not in all states, any man who can wield a soldering iron may hang out his sign as a practical plumber, and by his gross ignorance may imperil many lives. Now it is obvious that if doctors and druggists are to be required to know something about their business, the plumber should be required to forsake his study of the best way to make an unintelligible bill, for the best way to do a scientific job. Why not place all this work under the supervision of proper authority?

Water supply. My next suggestion relates to drinking-water. The "Old oaken bucket" is fast passing into history, and with it the well just back of the sink-spout, pig-pen, or privy vault. In place of the well there is an effort to bring pure water from neighboring brooks, rivers, ponds, or lakes. The same danger of contamination remains, because of the population of nearly every water-shed and the consequent washing of vegetable and animal decay into the streams

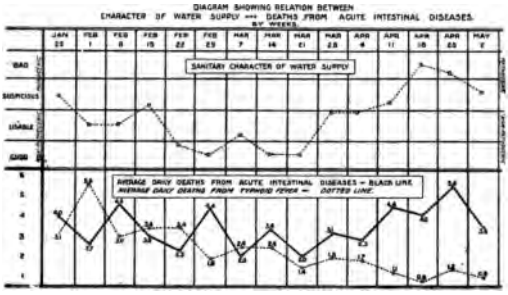


DIAGRAM SHOWING RELATION BETWEEN
CHARACTER OF WATER SUPPLY AND DEATHS FROM ACUTE INTESTINAL DISEASES.
BY WEEKS.
SANITARY CHARACTER OF WATER SUPPLY
BAD
SUSPICIOUS
USABLE
GOOD
AVERAGE DAILY DEATHS FROM ACUTE INTESTINAL DISEASES — BLACK LINE.
AVERAGE DAILY DEATHS FROM TYPHOID FEVER — DOTTED LINE.

or ponds. There is no better demonstration of the specific nature of this decay than that furnished by the Chicago health board, copies of which I have prepared for your

inspection. The filth of the city is dumped and the sewage is conducted into the lake from which they derive their drinking-water. The deadly parallel lines show conclusively the great necessity of the utmost care in selecting the water supply, and in protecting it from contamination.

The following from official sources is not without interest in this connection:

Deaths from controllable or preventable diseases in Chicago and New York during the first fifteen days of September, 1896:

	Chicago.	New York.
Acute intestinal diseases	159	87
Typhoid fever	48	21
Polluted water deaths	207	108

Deaths from diseases not directly affected or caused by polluted water:

	Chicago.	New York.
Consumption	86	209
Diphtheria	46	64
Measles	2	8
Scarlet fever	1	5
Cerebro-spinal fever	4	4
Deaths not due to impure water	139	290

This table shows according to Dr. Riley of the Chicago health office that Chicago far exceeds New York in the number of deaths from diseases caused by impure water. It shows furthermore that New York far exceeds Chicago in the number of deaths from diseases not directly caused or affected by polluted water.

Here are figures that are simply appalling. There are today six hundred cases of enteric fever in Chicago; six deaths daily from consumption. If small pox or riot should kill a tenth of this number, the whole country would stand aghast. And so my opening statement that no one heeds these insidious dangers, is demonstrated by figures.

At some future time it would give me pleasure to present a more complete paper upon this subject, showing the various impurities found in water which is commonly regarded as pure. I would like also to discuss filters which are abominations, and other modes of purifying water, but time will not permit.

Reporting cases. The last thought to which your attention is called, is the regulation requiring physicians to report promptly to the board of health all contagious diseases coming to their attention. There is a laxity in this respect which can only be overcome by making the neglect a more serious offence. Kind hearted physicians (and what successful physician is not kind hearted?) have yielded to requests for secrecy from those too proud to permit the display of the warning card of the health officer and often with the most serious consequences. In Bay City, Michigan, where diphtheria is prevalent, a reputable physician is under arrest for failing to report his cases. In Bethlehem, Penn., the same complaint has resulted in vigorous measures against physicians. There is danger that the "code" will prevent health officers who happen to be physicians from doing their plain duty. If there is not law enough upon this point, let us ask for more; if there is, let us insist upon the cooperation of the public as well as of physicians.

Not only should physicians report cases immediately, but they should never leave the process of fumigation after the discharge of the patient, to the family. A few pounds of sulphur burned indiscriminately about the premises is not fumigation in its truest sense.

I have referred to these several points requiring legislation, because there is nothing in the service of a legislator so imperative as the making of such laws as will protect people from the results of their own ignorance of sanitary and hygienic laws.

There is a text in my every topic for long and exhaustive discussion, but you are not expected to be thus afflicted. I take it that this meeting was called more for the purpose of getting acquainted, and for organizing a little army, well equipped and duly officered, to continue the study of sanitary science, and go forth better qualified, more enthusiastic to do better service in the cause of sanitary reform.

DISCUSSION.

Dr. J. T. Greeley, Nashua. Mr. President: In rising to express my appreciation of the papers read I feel almost as though I were stealing time from the valuable and interesting papers to follow. However I am interested in this paper, and so many points have been touched upon that

interested me that I cannot fail to express myself on one or two of them. Upon one point I have to differ with the doctor. He speaks of the plumber's only necessary qualification being the handling of a soldering iron. My experience is that that qualification is not required. He also spoke of the location of the well as behind the pig-pen, sink-spout, and privy vault. My experience is that the well is usually about equally distant from the three, only on lower ground. The question of the milk and water supply is one that is of interest to all the members of the community, and the health officer in particular. At present, as I understand, in the cities of the state we are protected from impure milk or water by occasional examinations, of a more or less superficial character, and at the best a chemical analysis is of little value, as the great danger in the milk and water supplies seems to me to come, not so much from adulterations or additions, as from bacteriological or pathogenic contamination, and a chemical examination is of little value in determining these. It seems to me that the only safeguard we can place around our milk and water supplies would come from a bacteriological examination, and that all suspected milk and water should certainly be so examined. A milk containing water, provided that water came from a pure source, is not necessarily dangerous; but a milk that has been placed in an atmosphere of disease, or even placed in pans that have been washed in impure or pathogenically unclean water, is a serious danger. The only manner of detecting such an insidious foe to our health is certainly a bacteriological examination, such as I believe is now depended upon in most cases of our sister states, especially in Massachusetts. Prof. Sedgwick, of the Massachusetts Institute of Technology, has done an interesting work in tracing the cause of typhoid fever from a bacteriological point of view. I think in a majority of cases he found that the milk was the cause of the epidemic, and that it was usually due to milk contaminated, not in the city,but at the source of the milk supply, by impure water flowing into the

well from the surface, from the direction of the sink drain or the privy vault, and the same water being subsequently used to wash the milk cans or to cool the milk. I would suggest that the establishment of a bacteriological department, for the analysis of the milk and the water supplies of the state, would be one step for this association to consider.

The question of expectoration from consumptives was taken up in Nashua by the board of health, and we experienced a great deal of difficulty in obtaining any satisfactory results, from the fact that most persons whose expectorations would be liable to contain the dreaded bacillus, are not aware of the fact that they are suffering from pulmonary or laryngeal disease, and their physicians and friends are, for a great many reasons, loath to inform them; therefore progress along this line is greatly retarded.

Mr. W. K. Robbins, Manchester. Mr. President: The gentleman from Nashua suggests the bacteriological examination of milk and water. At the present time it is not feasible. The bacteriologist who can make such an examination is a very scarce article at the present time, and another difficulty in the way is that he must be where the material is. Take a sample of water and send it to Durham or Boston, and the number of bacteria would greatly increase by the time it reached its destination, consequently an analysis of the water at that time would not fairly represent the water at the source. There is no doubt that a careful bacteriological examination of milk would reveal a startling condition of affairs. With the filthy methods of taking milk from cows in the condition in which they are kept now, one cannot doubt that bacteria are numerous in the milk, because the cows are filthy and are not washed. I hope we can look forward to an improvement in the present methods, but we cannot do anything immediately.

If we do not have another meeting of this association before the next legislature, we should take steps now to memorialize that body in regard to the plumbing laws of the state. We have carefully prepared plumbing rules in

Manchester and are trying to enforce them. Our rules and regulations are supposed to have the authority of law, but when we talk of enforcing them by legal process we find that something more is needed. There should be a state law in relation to plumbing, and at the same time the state should establish a state board for the examination of plumbers. No one realizes the necessity for this more than we in Manchester. There being no restrictions as to who may do plumbing, many undertake the work who never learned the trade, and their incompetence is more difficult to deal with than the negligence or dishonesty of the skilled workmen. We therefore feel that this association should take such steps as will place us on record in favor of a state law in regard to the examination of plumbers.

Another matter of very great importance is that all cases of tuberculosis should be reported in the same manner that other contagious diseases now are. Some may say this is not necessary, but we believe that it is. Last spring we prepared and addressed a circular to every physician in Manchester, requesting a report of every case of tuberculosis, in order that we might place in the hands of such persons rules and regulations for the restriction of the disease. We have received no report to the present time. This is the only way to get these facts and to inform the people how they may prevent contracting consumption, and physicians should be required to report every case to the board of health.

All cases of cholera infantum should also be reported, in order that circulars may be issued and instructions given as far as possible to reduce the death rate from this disease. Our death rate in Manchester is more than half in children under one year of age, and if the state law required the reporting of all such cases, we might trace the cause of many cases of cholera infantum, and thus help to reduce the mortality from it.

Dr. Irving A. Watson, Concord. Mr. President: We have with us Dr. S. W. Abbott, of Boston, secretary of the Massa-

chusetts state board of health, and I am sure we should like to hear from him in the discussion of these questions.

Dr. S. W. Abbott, Boston. Mr. President: In regard to the bacteriological examination of water and milk, and especially of water, we have examined some 15,000 or 20,000 samples of water in the past few years and to show how difficult the matter is, as to coming to any conclusion bacteriologically, let us reflect a little and see how we get the water. The bacteriological examinations of water are made upon a fraction of a drop! The man who takes a glass of water gets a thousand times as much as the dozen samples examined under the microscope. Now in the case of the epidemic of typhoid fever at Lawrence, no doubt the germs were in the Merrimack river, and the people drank them and died as a consequence; but we are not to suppose that that river is swarming with germs. They did not have the chance to multiply to that extent in coming from Lowell to Lawrence. The volume of water in the Merrimack is enormous, and germs may have entered it from the Lowell hospitals or from other places where there was typhoid fever; but the point is that in looking through a gallon of water we get only a very small portion of it under the microscope, and we may not get the germs. It is not only like looking for a needle in a hay-mow, but a great deal more so. The element of time also constitutes an important factor. Suppose a man has polluted a brook with typhoid discharges. Some one lower down the brook drinks the water and contracts typhoid fever—or possibly gets it from a well, and the board of health is notified of it a week or more afterward. The typhoid discharges go into the brook the first of the month; the man drinks the water the same day, but is not taken sick for ten days or a fortnight. The physician is called, and the week after looks for the cause. The board of health gets a sample of the water perhaps a month later; now what is the use of looking for the cause in this water? The germs have gone by, long ago. These are some of the reasons why a bacteriological examination of the water is

always unsatisfactory. If all the conditions and circumstances surrounding the water-supply are such as to lead us to believe that polluted water was the cause of the disease, we say that it probably was the cause. If, as has been said here, the well is surrounded by sink-drain, privy vault, etc., then there is probably cause for taking typhoid fever. In the case of the milk supply, it is not the milk itself, but the water; that is all there is about it. No one ever proved that a cow has caused typhoid fever by drinking polluted water and straining it out through her udder. It is polluted water almost every time that causes the trouble.

Mr. Herbert S. Clough, Manchester. Mr. President: Some two years ago in Manchester occurred a peculiar circumstance. It is the duty of the sanitary inspector in every case of typhoid fever to make an investigation and examination of the premises, ask certain questions in relation to the patients, two of which are as to the milk and the water supply, by whom furnished. We had at that time, I think, seventeen or eighteen cases of typhoid fever in the city, and of that number we found that eight were on the route of one milk-man coming from the adjoining town. As in duty bound the sanitary inspector called the attention of the board to the matter, and they immediately decided that the source of the milk-supply must be looked into. I was sent to the milk-man, and found that there were six milk raisers, who supplied milk for that route. At one of these houses I found a well very close to the house and almost over it was the sink-drain. The sink-spout came out into a wooden trough and the water ran away down the hill, but it was plain to be seen that at times the sewage had run over, and there was no doubt but that it passed directly into the well. A visit to the milk inspector showed that every sample of milk taken from this team was good; the man had never been known to adulterate his milk. We asked that he should cease to take milk from the raiser mentioned, or failing in that, that that particular raiser should cease to use water from that well to wash his cans in. I am sorry to say

that he continued to take the milk and that raiser continued to use that well, although he did attempt to clean it out, and in talking with one of the parties who cleaned it I was told that the stones showed discoloration from the sewage. Now the board of health in Manchester found that they were absolutely without any recourse in the matter; that we could not in any way reach that man without we could prove conclusively that those cases of typhoid fever were due to the use of that milk. I should be pleased to know if there was any way the board of health could prevent the sale of that milk.

Dr. J. T. Greeley, Nashua. Mr. President: I think I may have been misunderstood in regard to the bacteriological examination of milk and water, and particularly with reference to milk. I did not while speaking intend to convey the idea that a minute bacteriological examination should be made of all milk; but merely this, that a chemical examination of milk indicates to the chemist merely whether the milk is pure chemically, whether it has been adulterated with water, sewage, etc., but it does not and cannot indicate to the chemist and the public the exact constituents of the milk—the cleanliness of the milk. It does not tell whether the barn was clean, whether the milker had clean hands, whether the cow was clean. A bacteriological examination of milk does indicate more or less directly the time which has elapsed between the milking and the examination, the condition in which the milk is kept, and, incidentally, the condition under which the cow was milked and the condition in which the milk was cooled. I think that analyses followed out on these lines have indicated very clearly the great advantage of the clean stables, etc., the cooling of the milk under proper conditions, and the immediate consumption of the milk. All milk after it is drawn from the cow contains more or less bacteria. I think that for a time people thought that cows secreted bacteria, until absolutely germless milk was obtained under pains-taking precautions. My idea of a bacteriological examination of milk was some-

thing in this line, rather than a search for organisms in the vast quantity of milk that comes to us.

Mr. Spofford, Jaffrey. Mr. President: I am glad so much has been said about water. When I first came to New Hampshire, I located at Jaffrey, and people told me I had one good thing on my place and that was an excellent well of water, which I used for drinking purposes during the fall and winter. In the spring I took two gallons to Professor Sharples, at that time state assayer of Massachusetts. The analysis showed a very impure state of the water. I then had the well cleaned and found it needed it very much; then used the water about a year and then had a second analysis which proved the water about as poor as at the first analysis, which showed traces of sewage which must have been there before I came to the place. I then had an artesian well drilled and now have rock water. I believe impure water to be the greatest cause of sickness in the country. I would much rather drink city water than water from three fourths of the wells in the country. I once tested water from a well with nitrate of silver showing the water to be in a very impure state. Instead of being glad to find the water was impure people were angry to know the truth. Another important thing I would like to touch upon, that is in regard to vinegar. The farmers complain because the storekeepers will not buy their vinegar, but procure an article which they can get cheaper. On the other hand the local dealers say they can buy much better cider vinegar elsewhere and cheaper.

In regard to obstacles in the way of boards of health, we have had some experience in regard to an open ditch that runs back of some six or eight houses, into which all the sink-drains run, the land through which the ditch runs being owned partly by the town and the rest by private individuals. We have tried to have them unite and put in a drain pipe, each owner to pay his or her proportion of the expense, but some will not agree and so the ditch remains open year after year. We have it cleaned out once or twice during a season,

and that is the best we have as yet been able to do. We might compel each owner to care for their own on their own land but a cess-pool is a nuisance at best, not only to the people on whose premises it is located but to near neighbors as well. The people need to be more thoroughly educated in regard to their water supply and drainage. Every board of health should contain at least one physician.

Dr. C. H. Holcombe, Brookline. Mr. President: I was glad to hear Dr. Conn say that disinfection should not be left to the family to perform. In the little town from which I come, the board of health attends to the disinfection of the premises, and in this way only can it be done satisfactorily to the public. And we also do it at the expense of the town, and I believe it should be so done. If it is left to the family to pay the expenses, they say they can see to it themselves, and it is not always well done. I find there is a great difference in the practice of local boards of health in this respect and I should like to know what the state board of health requires local boards to do in this matter; whether they recommend local boards to disinfect at the expense of the town or not. The selectmen of many towns think the expense should be borne by the family, and in this way we meet with some opposition from the selectmen; but in our town the board of health has always claimed that the expense should be borne by the town, and has so done it.

DISINFECTION—FORMIC ALDEHYDE GAS.

BY IRVING A. WATSON, A. M., M.D., SECRETARY NEW HAMPSHIRE STATE BOARD OF HEALTH.

Every health officer or other person who has studied the subject of disinfection, or has had any practical experience in this essential sequence to the appearance of certain communicable diseases, realizes that the problem is still beset with many difficulties, notwithstanding the rapid advance which sanitation has made within a few years. Scientific knowledge, based upon many carefully conducted experiments and original investigations, has fully demonstrated

not only the indisputable utility of disinfection but has also established the exact values of many disinfectants.

We know that chloride of lime, bichloride of mercury, permanganate of potash, carbolic acid, and many other substances are germicides, if used in solutions of a definite strength and properly applied. We likewise know that the same is true, to a certain extent, of sulphur fumigation, which has long been held in high favor by executive health officers. Nevertheless, with all these facts before us, we are reluctantly compelled to admit that much of the so-called disinfection is little if any better than a pretence. The technique necessary to a complete disinfection of an infected room or house is not understood by the average health officer; nor is this at all surprising, because the subject involves in itself a considerable amount of scientific knowledge. Different diseases require different methods. That which would be effectual in typhoid fever might be entirely useless in scarlet fever, and that which would be efficient in scarlet fever and diphtheria, might be wholly worthless in anthrax. Again, in some diseases, as in typhoid fever for instance, complete disinfection might be practiced with a single solution, which in some other disease, scarlet fever for example, would be impracticable if not impossible.

Now then it is not expected that health officers in general will possess a scientific knowledge of disinfection and, therefore, it becomes necessary to put into their hands some method or methods that will secure the result desired without necessitating a college course in chemistry and bacteriology. There is one important fact which should never be lost sight of, and that is that there can be no partial disinfection—that it must be absolutely complete, else it is a failure. If the minutest amount of infecting material remains undestroyed, the operation has been faulty and subsequent outbreaks are liable to occur.

The state board of health has, from time to time, in its reports and by special circulars, published information for the guidance of local boards of health in the matter of disinfection, giving methods which are regarded as the best to destroy the infection of certain contagious and infectious diseases. Among the agents recommended is fumigation with sulphur. It is probable that this agent is used more extensively in all civilized countries than any other, and yet it is often unsatisfactory, inefficient, and usually objectionable on account of its liability to destroy certain fabrics and its

pungent and lasting odor. It may be truly said that its general use has been forced because of the lack of something equally good, or better, to take its place, although it is now confidently expected that it may soon be supplanted by a more effectual and far less objectionable agent, formaldehyde gas, a discussion and exhibition of which is the chief object of this paper.

The general plan of disinfection now in use is something as follows:— Disinfectants in solution are used in the sick-room in vessels, cuspidores, etc.; soiled clothing immersed in a suitable solution or in boiling water; solutions for physicians' and attendants' use in washing hands and faces, and for all general uses to which disinfectants in solution can be applied. After recovery, or death, of the patient comes the health officer to fumigate the apartments with sulphur dioxide, after which the premises are pronounced free from infection (?).

Now all these efforts from beginning to end may have been effectual, or they may have been a complete farce through a lack of attention to minute details. In the first place, instead of employing some of the standard disinfecting solution in the sick room, the family may have been induced to use some well advertised commercial preparation, possibly possessing deodorant properties, but wholly worthless as a germicide. It is to be regretted that the attending physician does not always take this matter in hand as one of his exacting professional duties in the case. He should not only recommend the bedside disinfectant, but should carefully instruct the family and attendants in its use.

Second comes the final disinfection by sulphur fumigation (if that be selected). This is a duty incumbent upon the local board of health or its qualified agent, and should never be left for the family to perform. It is unnecessary here to go into all the details of the process, since you are already familiar with this part of the subject. There is, however, I am certain from observation, not always sufficient attention given to two points in disinfecting with sulphur dioxide, to wit: First, that the room or rooms be tightly closed; and second, that at least three pounds of sulphur should be used for each 1,000 cubic feet of space.

Some of the experiments made by the committee on disinfectants of the American Public Health Association, demonstrated the fact that the entire success of the process depends

upon these two points. It is necessary that the fumes of the burning sulphur should penetrate every part of rooms and material to be disinfected, and in a given volume, else the attempt is futile and the operation results in only a fancied security against subsequent infection. Much of the so-called disinfection practised by many families is wholly inefficient and useless. The odor of burning coffee, tar, sulphur, or any other substance in the sick-room, or other part of the house or premises, in the presence of the patient or other persons, operates only as a deodorizer, and does not destroy the germs of the disease. This is an important fact that every family should understand.

I have dwelt at considerable length upon existing methods of disinfection under the presumption that some or all of them may, through necessity, be continued in actual practice for some time to come, and also in the belief that what has been said in regard to the technique of disinfection will be always applicable.

I come now to a subject in which I am sure you will be especially interested, and that is Disinfection by Formic Aldehyde or Formaldehyde Gas. It is yet too early, perhaps, to make emphatic promises as to what place this agent will take as a disinfectant, but it looks as though we have much to expect from it as an efficient, convenient, and a comparatively unobjectionable substitute for sulphur fumigation. During the past few years many experiments have been made with a substance called formalin, known chemically as methyl aldehyde and formaldehyde. Commercial formalin is an aqueous solution containing about forty per cent. of the gas. Experiments made with this solution demonstrated that it was a powerful disinfectant, but it was likewise very objectionable in the aqueous form. If poured upon cloth or sponges and allowed to evaporate, the gas is sufficient to disinfect very small spaces, but this plan is not practicable for general disinfection.

In 1861 Hoffman discovered that if the vapor of wood alcohol, mixed with air, was exposed to red hot platinum, a chemical transformation took place resulting in formic aldehyde gas; if common alcohol were used, the result was acetic aldehyde gas. Since considerable attention has been given to the germicidal qualities of formic aldehyde, several scientists have attempted to construct a lamp that would produce the gas with such facility as to make it applicable to house disinfection. During the past year lamps for this

purpose have been described by Gambier, Brochet, and Frillat, in France; Tallens, Dundonne, and Krell, in Germany; and Robinson and de Schwienitz in this country, and perhaps others. From a description of these lamps it would seem that while all of them possess more or less merit, that made by Prof. F. C. Robinson, of Bowdoin college, is superior on account of its easy manipulation and the large amount of gas it will produce in a given period. In most of the lamps referred to the wick is of large size and covered with a perforated platinum cone or cap or with a fine platinum screen. These lamps are lighted in the same manner as an ordinary lamp, and when the platinum screen or cone has become red hot, the flame is extinguished, while the platinum cone continues to glow and to form the gas until the alcohol is exhausted. In one or two of the lamps a sub-flame is used to heat and vaporize the alcohol. De Schweinitz constructed his apparatus for the generation of this gas from an ordinary large-sized Rochester lamp, by attaching a piece of asbestos, about an inch and a half in length, to the top of the circular wick, the asbestos being then saturated in a solution of platinum and dried. The lamp was operated by simply lighting it and as soon as the asbestos became red hot, the flame was blown out, and the lamp continued to generate the gas as already described.

The lamp devised by Prof. Robinson, which I have the pleasure of exhibiting at this time, is constructed upon a somewhat different principle, doing away entirely with a wick. It will be seen that this lamp has the appearance of an ordinary student's lamp, except that in place of the small tank, ordinarily containing the wick, is a large, shallow pan, into which the alcohol flows to the depth of about a quarter of an inch, and is maintained at this depth as long as there is any alcohol in the tank.

A large circular disk of asbestos, perforated with many small holes and saturated with a platinum solution, constitutes the wick which transforms the alcohol into formaldehyde gas. The experiments thus far made with this lamp would seem to indicate that it is well adapted to practical use in room disinfection. It requires no expert skill to manipulate it, only the ordinary care necessary in handling a large lamp. At the recent meeting of the American Public Health Association two papers were read upon this subject: One by Prof. F. C. Robinson, on "Formic Aldehyde: Its Practical Use," and the other by Dr. E. A. de Schweinitz, on "A

Convenient Lamp for the Generation of Formaldehyde Gas, and a Method of Determining the Amount of this Gas in a Given Space." I shall here quote extensively from that portion of Prof. Robinson's paper which related to his practical work with the lamp:

"I selected a room containing about 3,000 cubic feet and having three large windows with very loose sash. I found that one litre of alcohol used and the room closed for four hours was not enough to completely sterilize infected matter, if it was covered up or concealed to any great extent; but when two litres were used, or even one and a half, complete sterilization resulted in about three and one half hours. I mean complete destruction of diphtheria and typhoid cultures, and no turbidity in any of the cultures within two days. Occasionally, after five or six days a slight growth of the hardier molds would appear in some of the cultures, as other observers have noticed.

"The remarkable penetration of the substance was shown by the fact that all parts of clothing, including seams, inside of pockets, etc., were sterilized in all parts of the room. Typhoid bacillus was destroyed even when buried half an inch deep in sand.

"But perhaps the most remarkable results were obtained from bedding. Cultures of typhoid and diphtheria were placed under the clothes, under the pillows, and even within the mattress, and found killed by two litres of alcohol in seven hours. The same result was obtained when cultures were rolled up in a mattress and the whole tied into as compact a bundle as possible.

"The reason of the remarkable penetrating power of the gas is undoubtedly in the fact that when hot it is of almost the same specific gravity as air, and hence readily mixes with air and has no tendency to separate. But while its specific gravity is favorable to its penetration, it is also favorable to its escape from a room, hence it is very quickly removed from a room upon opening doors and windows. It also escapes readily from all leaky places in a room. This is why results in small, close chambers or boxes are far different, in amount needed, from those in large rooms. The more open the room, the more must be used. It is for this reason that I am of the opinion that effective house disinfection cannot be most economically done by generating the gas in a single room and allowing it to pass through open doors and stairways. In my judgment three quarts burned in

three different parts of a house would be as effective as six burned in one place. It is, however, rather rare that a whole house needs disinfecting. Commonly a single suite of rooms, not more than two in number, are infected. Two quarts of alcohol burned in one of them and the rooms kept closed for from three to four hours would, I think, be sufficient.

"I do not believe that it would be at all safe to burn less than a quart in any ordinary living room."

Dr. de Schweinitz in his paper stated that he had tried the effect of this gas on cattle ticks, and found that young ticks were killed in an atmosphere containing one and one-half to two per cent. of the gas, while the old ticks were but slightly affected in an atmosphere containing five per cent. of the gas. He relates, however, an interesting point in the direction that a calf kept in an atmosphere containing five per cent. of this gas for three hours was not greatly affected; it coughed a few times, there was a little water from the eyes and nose, but it recovered as soon as removed to the fresh air, and showed no after effects from the inhalation of the gas.

Dr. de Schweinitz states that if none of the alcohol is wasted while being converted into the aldehyde, a litre (about a quart) of the wood alcohol will give five per cent. of this gas in a room containing 1,000 cubic feet of space.

This gas is not only a powerful germicide, as shown by the experiments of Prof. Robinson, but it is likewise a powerful insecticide, readily destroying moths, buffalo bugs, etc. Dr. J. J. Kinyoun, of the U. S. Marine Hospital Service, has given this subject some attention for the past two years or more. In discussing the question of car sanitation at the Denver meeting of the American Public Health Association, he stated that he had been conducting experiments during the three months prior to the meeting, and he had found that formalin had "remarkable virtues against the bacillus tuberculosis and diphtheria, and does little or no injury to fabrics." He stated that he had tried it upon almost everything from a mattress to fine silk, and there was no resulting perceptible injury to the material, whether dyed with organic or inorganic colors. Diphtheria and tuberculosis germs in a dried state were killed by it, and the infection of small-pox was destroyed in a few moments.

The specific gravity of the gas being nearly the same as that of the atmosphere, it is rapidly diffusible, and this no doubt accounts for the complete disinfection which resulted in the

experiments performed. The evidence thus far is unanimous, as far as I know, that in formaldehyde gas we have a thorough disinfectant. Its application seems to be easy, and we have reason, I believe, to expect great results from its use.

W. D. Baker, Rumney. Mr. President: I have been very much pleased with the paper and the exhibition that Dr. Watson has given. I have had some experience with fumigation, and we are obliged to do it with sulphur, and I will assure the doctor that I have used three pounds in every instance. Of course in some cases fabrics were injured, but that was of small consequence. There is one point that I want to ask about, and that is the item of expense. I think Dr. Watson mentioned that the asbestos disk is dipped in a saturated solution of platinum and then dried. Can the disks be obtained commercially in that form? or would they have to be prepared?

Dr. Watson: The disk is simply a sheet of asbestos that may be found in any tin shop, with a piece of metal put around it to hold it in shape. It is then punctured over its entire surface with small holes. A solution of platinum is poured upon this and allowed to dry. The expense of disinfecting by this method is very small indeed. It is estimated that it takes a litre of alcohol for a room containing 1,000 cubic feet. The wood alcohol can be purchased for $1.25 a gallon, and perhaps less.

Dr. Holcombe, Brookline. Mr. President: I think we were somewhat disappointed in the report of the committee of the American Public Health Association, that they had not made more progress in this subject, and I do not know whether it is proper, with our present knowledge of the method, to make a change in the manner of disinfecting.

Dr. Watson. Mr. President: In regard to the Buffalo meeting of the American Public Health Association I can say that the reason why no complete report was made upon this matter at that meeting, was probably because there was no committee last year upon disinfection and disinfectants,

and the papers were presented as individual papers simply. A discussion of the subject was brought about by Dr. Kinyoun, under the head of car sanitation. The papers presented by Prof. Robinson and Dr. de Schweinitz were independent papers. These papers were incomplete and did not by any means give all the results of their experiments. The experiments of Prof. Robinson have, it seems to me, practically settled the question as to its value. The penetration of this gas is remarkable. Doubtless more experiments may be necessary before it will become thoroughly practicable for general use. Prof. Robinson has experimented, among other things, with cultures of the bacillus of typhoid fever, buried an inch in sand packed down hard, and at the end of four hours, upon opening the room, found them dead. A great many other experiments have been made, and the bacillus was killed in every instance. The question as to the germicidal power of the gas is almost definitely settled, as well as the utility of its use. This method of disinfection has not been officially recommended by any authority yet. No apparatus has been made in this country, except for experimentation, and it has not yet been generally made public. But it occurred to me that the time was ripe to present the matter to our local health authorities and that it would be an interesting matter to bring before you at this time, and in order to do so I went to Augusta and got the lamp for the purpose of demonstrating the principle today. If you do not feel like adopting the system at once, you can see what is likely to come into use.

ON THE RELATION OF STATE AND LOCAL BOARDS OF HEALTH TO EACH OTHER AND TO THE PEOPLE.

BY SAMUEL W. ABBOTT, M. D., SECRETARY OF STATE BOARD OF HEALTH OF MASSACHUSETTS.

A noted English statesman (Lord Beaconsfield) is reported to have said that "the health of the public ought to be one of the chief considerations of the statesman." A consideration of the means, measures, and methods adopted by sanitary authorities for securing the highest degree of

public health ought, therefore, to be a matter worthy the attention of any audience convened for the specific purpose for which you are today assembled.

It is my intention, in this paper, to present the relations of state and local boards of health to each other, and to show in what manner such boards may be mutually helpful and also how their harmonious relation to each other may be productive of the greatest good to the community in general.

To describe in an intelligent manner the relations of state and local boards of health to each other, it is essential, first, to know what are the duties of such boards, as ordinarily constituted.

Dr. Billings, whose authority in public health matters in America is unquestioned, states the functions of a state board of health as follows:

"1. To promote the organization of local and municipal boards.
"2. To obtain medical and vital statistics.
"3. To investigate the causes of undue sickness and mortality as indicated by these statistics.
"4. The removal of these causes, acting as far as possible through the local and sanitary authorities.
"5. The supervision of the hygiene of state institutions.
"6. The supervision of quarantine."

The powers and duties of local boards of health may be stated as follows:

"1. The management, control and prevention of infectious diseases, including isolation, disinfection, vaccination; the superintendence of contagious disease hospitals, and the power to remove patients to them.
"2. The suppression and removal of local nuisances.
"3. The inspection of tenement houses and factories.
"4. The medical inspection of schools and school-houses.
"5. The disposal of garbage, ashes and night-soil.
"6. The supervision of cemeteries and burials.
"7. The inspection of the food supply.
"8. The assignment and regulation of offensive trades.
"9. Infant mortality and protection of infant life.
"10. Supervision of plumbing.
"11. The collection of vital statistics of the city or town."

It will be noticed in the digest which I have presented that the chief difference between state and local boards

consists in the fact that the duties of the former are largely advisory and educational, while those of the latter are mainly executive. The following extracts from the organic laws of your own state and from those of Massachusetts, creating the state boards of health, show the character of their functions quite clearly:

Acts of 1881. Chapter 64. New Hampshire. "Sec. 6. The board shall take cognizance of the interests of health and life among the people of the state, making sanitary investigations, and advising and assisting local boards of health in conducting special investigations into the cause of epidemics and the sources of mortality, and they shall collect such information in respect to these matters as may be useful to the people of the state, and report the same through the governor and council, in the same manner as other state officials are now required to do."

Acts of 1886. Chapter 101. Massachusetts. "Sec. 4. The state board of health shall take cognizance of the interests of health and life among the citizens of the commonwealth. It shall make sanitary investigations and inquiries in respect to the causes of disease, and especially of epidemics and the sources of mortality and the effects of localities, employments, conditions, and circumstances, on the public health; and shall gather such information in respect to those matters as it may deem proper, for diffusion among the people. It shall advise the government in regard to the location and other sanitary conditions of any public institutions."

That this distinction between the two bodies, advisory and executive, is not popularly understood is quite plain from the fact that multitudes of letters are annually received by state boards of health requesting that they will remedy local nuisances in cities and towns. Let us take an example. John Jones writes to the state board of health, as follows:

"My neighbor, Mr. R———, whose premises adjoin mine, maintains a nuisance, namely, an overflowing cess-pool, on his land within twenty-five feet of my house. He has also allowed a dead horse to remain in his barn yard for a fortnight past, in such a place as to cause a serious nuisance to my household. Will you kindly send an agent of your board to this town and abate the nuisance? I have appealed to the town board of health in vain. They have come and looked over the fence at Mr. R———'s premises and gone away without abating the nuisance. Yours truly,

John Jones."

What course is to be pursued in this instance? The state board has not in Massachusetts, nor so far as I can learn in New Hampshire, any authority or jurisdiction in the matter. My own observations in the matter lead me to believe that in the majority of instances,—yes, in nearly all, the complaint is a just one so far as the existence of the nuisance is concerned. In Massachusetts, there is a law allowing an appeal to the county commissioners. So far as I can learn, this law is practically a dead letter. Multitudes of persons have applied to me, personally or by letter, upon this matter from all parts of the state, and I have invariably notified them of the existence of this statute, but in no single instance have I ever known it to be used in practice. The reason probably for this lies partly in the defective wording of the law, which is permissive and not obligatory.

The county commissioners "may hear and determine" and exercise the powers of a board of health; not, "shall hear and determine." And, again, this board of officials probably does not deem itself a proper body for the execution of sanitary laws and regulations. What then? A private citizen has still left open to him the courts of justice where complaints may at any time be entered against an offender under the ordinary process of common law. It seems, however, to be unjust that private citizens should ever be compelled to bear the expense of a public suit at law, when the statutes provide officials whose duty it is to attend to such matters and furnish the proper remedy.

The reasons for such action or want of action on the part of local boards are plain. The local board in small towns is usually composed of citizens, some of whom at least are more or less dependent upon the remainder of the community either in the way of trade or by family ties or from other similar causes, and hence they are slow to act against those who have possibly been lifelong friends and neighbors. Again, the compensation of a local health officer is often entirely inadequate to pay for the time and services rendered. Another and more practical remedy is sometimes applied by the aggrieved citizen, especially if the nuisance in question occurs within a short time before the annual town election. He appeals to his neighbors, and they acting in combination, the inert board or possibly the inert member whose time expires, if the law provides for an annual election of only one, find themselves displaced by one or more who agree to take a more active stand in the matter.

Another means, and a more general way of improving this condition of affairs, is by enlightening the people as much as possible in sanitary matters. Herein the state board of health may do much in distributing sanitary information. In teaching the general population the advantages of municipal and of private cleanliness, in issuing circulars and periodicals containing in popular language just the required information in regard to the best means of preventing disease, of the best kinds of diet for the mechanic, the laborer, the student, etc., the right methods of ventilating houses and apartments and other similar information.

Again, the holding of sanitary conventions in different parts of the state is one of the best methods of awakening public interest in such matters and of stimulating the population to improve in all that pertains to public health.

Pardon me if I again allude to our own state. We formed an association in 1890 entitled the "Massachusetts Association of Boards of Health," the object of which was "the advancement of sanitary science in the state, the promotion of better organization and co-operation in the local boards of health, the uniform enforcement of sanitary laws and regulations, and the establishment of pleasant social relations among the members of the association."

Organizations of this character exist in all civilized countries and are mutually helpful, especially to the local authorities. The plan of organization differs materially in different places. If I were to offer a word of counsel to those meditating a new organization it would be to make it as practical as possible in its working. Let it be so constituted that its meetings may be held in different parts of the state. Make its plan of organization as broad as possible so as to include in its membership people of all professions who may be interested in sanitary matters,—men and women, physicians, teachers, clergymen, engineers, lawyers.

In this way the real good of the commonwealth,—the true public health,—would be more advanced than by an exclusive organization composed only of health officials. Teachers would be glad to come to such a gathering and hear about school hygiene; engineers would discuss water supply and sewerage; architects, ventilation; and plumbers, plumbing; physicians discuss here the management and control of infectious diseases and the latest discoveries in bacteriology; lawyers may consider the legal questions which are constantly arising among local boards of health; and the

clergymen look on with a benign blessing on the whole assembly. I shall refer to this later on.

Of the functions assumed by state boards of health, some are peculiarly appropriate and others more or less incongruous.

1. First of all, Dr. Billings mentions the duty of promoting the organization of local boards. The state board may accomplish this in two ways:—

   a. By direct appeal to the local authorities through publications and circulars of the board.

   b. By recommending more efficient legislation with this end in view.

2. The collection of vital statistics. This is peculiarly an appropriate function of the state board of health, since vital statistics are the groundwork and basis of the actual knowledge upon which all sanitary work is founded. They constitute the mathematics of public health. Without them the health authorities work in the dark and they are entirely at sea so far as actual, definite information as to the results of sanitary work is concerned. With them the same authorities have a standard with which to measure the benefits of sanitary administration. The board of health, too, best appreciates the value of vital statistics and the methods of collecting, tabulating, and presenting them for public information. Fortunately, your own state, in strong contrast to a few of the other states, has placed this work in the hands of the most appropriate authority—the state board of health.

3. To investigate the causes of sickness and mortality as shown by these statistics. This is another important duty of the general board of health, and one in which the state board may act in harmonious co-operation with the local board. The diseases which it is the peculiar function of the sanitary authority to investigate are those of the infectious class, since the majority of the diseases of this class are more or less preventable and, hence, are worthy of especial attention in order that their causes may be known, since a knowledge of the causes of disease is essential to the intelligent application of the means for their prevention.

4. The removal of these causes. This duty is dependent upon the last-named, but its execution is more properly the function of the local than of the general authority. In such matters, however, the state board may very properly act as an advisor to the local board with reference to the means and measures to be employed.

5. The inspection of public institutions. This is an appropriate duty for the general board, although in some states it is performed by a state official especially appointed for the purpose, either acting independently or under the supervision of some general board.

6. The supervision of quarantine. By this term "quarantine" I mean the general use of the word; that is to say, the protection of our borders and, hence, of the whole territory from the invasion of infectious diseases of any sort which may come within the control of human power. Such action should be complete and uniform in its character and should extend to every seaport and every avenue of approach along the border limits of the country. The strength of the chain is determined by its weakest link. A single unimportant seaport, loosely guarded, may admit the enemy, and the whole country suffers.

Several of the early invasions of cholera of a half century ago entered the United States by way of Quebec and Montreal; hence, while the local health authorities of seaport towns may properly have the immediate charge of quarantine at each port of entry, there should be some general supervision even of a more general nature than a state board of health. I mean a national health board which shall have general care of all quarantine matters beside abundant opportunity for making sanitary investigations which our wide-spreading territory will always afford. It is no credit to the United States that we are still far behind the principal civilized nations in this respect.

7. Other duties. To all these duties there may properly be added the general supervision of the food supply, of the protection of the pure water supplies of the state from pollution, and the closely related subject of sewage disposal of all cities, towns, and public institutions. In order to reduce the prevalence and the fatality of infectious diseases as much as possible, the state board may very appropriately have control and supervision of the methods of determining the character of suspected cases of dangerous infectious diseases, such as diphtheria, tuberculosis, rabies, malarial fever, trichinosis, etc., and of the preparation of the different substances employed for the purpose of securing immunity from different diseases, such as vaccine lymph, the various antitoxins of diphtheria and of tetanus, and of any future material of the same nature which the acuteness of human investigation and observation is likely to discover.

As an instance of the lifesaving character of such work, I trust that I shall not appear to claim too much for my own state if I give a brief illustration from our experience. Under the provision of a law of 1886, the state board of health has given official advice to the authorities of cities and towns upon questions relating to water-supply and sewerage in about four hundred instances. Every one of the applications for such advice has been carefully considered by a committee of the board and by them submitted to its engineers, chemists, and other experts for their opinion. This opinion has, in many instances, been confirmed by the results of careful experiments, sometimes extending over a period of several months or years. Among these applications one came from the city of Lawrence as to the best mode of purifying its badly polluted water-supply. After thoroughly weighing the question, the board advised filtration through sand and the filter was built as planned by the board. The result has been a very decided reduction of the death rate from typhoid fever in Lawrence and the consequent saving of about one hundred human lives.

The distribution of about three thousand packages of antitoxin throughout the state has, undoubtedly, been the means of saving a much greater number of lives from death by diphtheria.

8. Allow me to allude to one more duty which has been much neglected in this country and which every state board may well enter upon with profit. I mean the subject of industrial hygiene in the great manufacturing centres of our states; thousands of operatives are busily engaged in the manufacture of cotton, woolen, boots and shoes, leather, paper, or cloth, and of rubber goods. Each one of these occupations has its dangers in a greater or less degree; bad ventilation, dusty floors, insufficient light, dampness and other unsanitary conditions, shorten the lives of wage earners and, hence, should be made the subject of careful study and of supervision by some general and sanitary authority in order that the evils may be corrected, and the life of the operative prolonged and his usefulness increased.

The diffusion of information as to public health principles is peculiarly the duty of the general board of health and much good has been accomplished throughout the country, doubtless, by the reports, documents, bulletins, circulars, and other information published and spread broadcast throughout the land by boards of health. Let us take an example:

—Consumption, fifty years ago, was not considered an infectious disease. About thirty years since, Dr. H. I. Bowditch in an article in the 'Atlantic Monthly" expressed his opinion quite strongly in the direction of a belief in the infectious nature of consumption. This belief has been very often confirmed by the experiments and observations of later professional men, until boards of health have taken up the matter practically and issued manifestoes in relation to it, some going so far as to recommend the isolation of consumptives and the placarding of their dwellings. But the pendulum has begun to swing back a little and this radical position has been found to be altogether too extreme. Many consumptives live for years in a comparatively comfortable condition, supporting their families and accomplishing a great deal as wage-earners. The plan of isolating and ostracizing these persons like lepers is a hardship which is unreasonable and unjust.

Just here is where state and local boards of health could do much good by showing the people where the true danger lies, namely, in the careless disposal of the sputa, and if this is properly destroyed or disinfected the danger is practically reduced to nothing.

There is one duty which, especially in the western states, has been imposed on state boards of health which in the opinion of many should never have been given to them, and that is the registration of medical practitioners. This function which has reached its highest degree of perfection as an administrative duty in the state board of health of Illinois, is not a sanitary duty at all, but a mixture of police and educational functions which have no natural place in connection with sanitary work. So far is this true that in those states in which the most arbitrary powers are conferred on the state board of health in this direction, the supervision of medical registration appears to have over-topped and put out of sight the far more important functions which have to do with preventative medicine. In fact, in some of the states, the registration of medical practitioners appears to have been loaded upon the state board of health at the outset of its establishment for the reason that western legislators appear to have found no other duties for the health board to perform.

Having now passed in review some of the duties of a state or general board of health let us again briefly enumerate the duties of the local board. As stated in the outset these are

mainly of an executive character, a fact which is self-evident. The local authority is by virtue of circumstances "on the spot" and can act immediately in every emergency. The local health laws usually confer upon the local board powers more absolute and more decisive in their character than those which apply to any other local board or officer. I will briefly enumerate these duties without a lengthy explanation of their nature.

1. The management and control of infectious diseases with especial reference to the prevention of their spread. This important duty may be subdivided into several functions, such as the notification of infectious disease by attending physicians and others; isolation, including isolation at the home of the patient, isolation in the infectious disease hospital, and the supervision of such hospitals by the local board of health, and exclusion of infected pupils and children of the same households from school; disinfection and destruction of infected articles; vaccination.

2. The suppression and removal of local nuisances.

3. The inspection of tenement-houses and factories.

4. The medical inspection of schools and school-houses.

5. The disposal of garbage, offal, ashes, and night-soil.

6. The supervision of cemeteries, the registration of all burials, and the licensing of undertakers; especially the control of burials and transportation of bodies of persons dead from some infectious disease. In this connection, however, it may be stated as a sanitary principle that one ambulant case of infectious disease, that is to say, a living, breathing man, woman or child walking about, who is suffering with an infectious disease (and there are many such people) is a far greater danger to the community than a more severe case of the same disease ill at home, and in bed in his own house; and a man, woman, or child sick in bed with any infectious disease also constitutes a far greater danger than the dead body of the same man, woman, or child carefully closed and shut up in a coffin, as a rule. The forbidding of public funerals in cases of death from infectious diseases is a wise precaution, but the reasons for adopting this practice consist mainly in the fact that the house where the dead body lies has become infected, rather than in the presence of the dead body itself.

7. The inspection of the food supply with especial reference to the supervision of the milk both at the dairy of production and along the route of its sale to the consumer, and

not so much in the direction of the prevention of fraud as of preventing the spread of certain diseases, chiefly typhoid fever, tuberculosis, and scarlet fever.

8. The direct control of offensive trades.

9. Infant mortality and protection of infant life.

10. Plumbing inspection. I have placed this subject last on the list, not because it is of the least importance, but because it is one of the least of sanitary duties. The great importance commonly attached to this subject arises from the assumption that defective plumbing is a fruitful cause of disease. This does not appear, however, to have been very conclusively proven. We often hear the remark when a person has been taken ill with diphtheria or typhoid fever, "Well, the plumber was called in to inspect the house and found a serious defect in one of the traps," or "a leaky soil pipe," or "a broken drain in the cellar", and there the investigation ends. No other cause is looked for. Is this course of reasoning creditable? I would, by no means, be understood to say that no attention should be paid to the subject. I should prefer living in a well-plumbed house rather than a defective one, but what I would say is that this question should not be allowed to engross the time and attention of the board of health to the exclusion of more weighty matters.

Having now defined the duties of state and local boards we are prepared to ask the question,—How may these boards assist each other and the community at large in the great and important duty of improving the public health and the prevention of diseases?

The state board can aid the local board and increase the efficiency of the latter by conducting investigations of infectious diseases throughout the state and learning their causes and advising local boards as to the best methods of preventing them, and at the same time taking advantage of the large experience of other central authorities and of its own experience in similar matters. It can act as an advisor to the local board in doubtful cases, but should be cautious in the matter of interpreting the laws of the state, such duty being a proper function of the legal authorities only. The state board can act as a central authority in the distribution of important sanitary information, both to local boards and to the general public, and may also, with a liberal financial support, act as a distributing agent for all those substances which can be employed for combating infectious diseases,

when the local board cannot be expected to maintain the expensive plant necessary for such purposes.

The local board, in turn, may aid the state board by cheerfully giving information as to infectious diseases occurring within the jurisdiction of the local board; by complying with all reasonable requests for such information and promptly filling all blanks and circulars of inquiry issued by the state board; by acting as a medium for transmission of all important information from the state board to the community at large; and by forwarding all returns of vital statistics which are voluntarily asked for by the state board, or are the subject of legal requirement.

Both boards may be of great service to the community by executing, without fear, those laws of the state which define their official duties; by acting as educators of the people in sanitary matters, both in the line of individual health and of that collective condition which is commonly called the public health. As a valuable promoter of this latter condition, I can cheerfully commend the custom of forming permanent organizations for the discussion and advancement of hygiene in general, such as the "American Public Health Association," "The British Sanitary Institute," "The Berlin Health Society," "The International Congress of Hygiene," and the more limited state organizations.

The Massachusetts Association of Boards of Health has now been in existence about six years. It has proved an exceedingly useful adjunct to local boards of health. The ideal state organization should include not only state and municipal health officers but all persons of any profession whatever who are interested in sanitary matters. Such organizations are public educators, and without education public health would be at a standstill.

Allow me in closing to quote the words of one of the efficient health officers of Great Britain, Dr. Sykes of London:

"Education, elementary, advanced, technical, practical, and popular, is the key that must unlock the doors of ignorance and let in the light and air of hygiene nearly as fully as other human knowledge. The knowledge acquired by education must ultimately and alone be trusted to bring home to the nation, that the acquisition of health means the acquisition of wealth."

A PLEA FOR A SANITARY MARRIAGE AND HOME.

BY C. W. DOWNING, M. D., MANCHESTER.

In presenting this subject for your consideration, I ask your kind indulgence because like castor oil, it cannot be made very palatable. A subject so generally guarded by sentiment, having its very roots in the affections, which must never be interfered with (?), and so near home, makes it nauseous. How easy it is to heartily discuss questions which are remote from us, for instance, the evils of polygamy and the Armenian atrocities. It is true we should be solicitous how public sentiment regards innovations, for quite often it is right, in fact, on all subjects fully understood, but necessarily to make it a criterion regardless of their being rightly apprehended, is folly.

At first, was not public sentiment terribly opposed to vaccination and the abolition of slavery? The question to be answered is, Is it right? The correct answer to this is paramount to public sentiment. If the affections were infallible it would offer an insurmountable barrier to the consideration of this subject. To learn that they are fallible we have only to look at our divorce records and the many homes where one or both parties have ceased to "love and cherish" each other. That it is a question near home ought to afford one of the best reasons for its consideration, regardless of the uneasiness it causes us.

My object in presenting it is two-fold,—first, too little attention is directed along this line, and secondly, its importance, for it seems to direct a blow at the very root of the upas tree, insanitation.

That "an ounce of prevention is worth a pound of cure" is an acknowledged fact. Is it not a lamentable fact that too few ounces are expended? We wait and wait until reform is necessary, which only can be accomplished with pounds, whereas reform ought to be our ideal which can be met with the smaller expenditure of owners: it is the familiar 16 to 1. It is true, reform must be continued in all departments, but if a little effort were expended before wrong doing was begun, and future generations directed into the fertile plains of high and right living, much of our reform work would cease and man would be seen less scarred and maimed.

Perhaps, necessarily, reforms are slow and commence with that which is least objectionable, until finally the very

root of the matter is reached. "The great lies mirrored in the small."

Vast sums of money and almost innumerable societies, organizations, and institutions,—local, state, national, and international,—are engaged in one form or another to rescue the mighty current of humanity from insanitation's Niagara. How little is done to radically intercept the course of those who have not commenced, but will surely be commencing life's voyage! Is this not our vantage ground as sanitarians? It is a high and noble thing to reclaim a man from disease, but far nobler and grander to prevent disease and suffering.

It may be said that we cannot legally prevent unsanitary marriages. Be this as it may, one thing we can do; deprive such of the seal of our approbation and until the people have a more practical knowledge of these matters we can patiently disseminate that which we regard as common-place truths. Rather than by our silence to consent to unsanitary unions, we ought at least to offer a word of warning and protest.

Is it not an appalling fact that the garments of many innocents lie at our feet and we are dumb as oysters, simply consenting unto their death by our silence? The remorse which filled the heart of Saul of Tarsus when he fully realized that without protest he had really consented to the death of the innocent Stephen must have been almost unbearable, but not more so than to people ever since when they have realized that they have been consenting to wrong doing. If today everyone who knows that wrong is being done, would stop consenting to it by their silence, how long would these unsanitary maelstroms go on with their deadly work? Besides withholding our consent to wrong living we must get in the way of expecting the maintenance of a higher standard. Just so long as those in authority presume that those under them will necessarily do wrong, their presumption will be realized. On the other hand, our hopes will not be wholly unrealized when those with whom we deal are once convinced that we expect high and noble living. To realize much we must expect much. I cannot believe that a child will put its hand in the fire if he is thoroughly educated to the fact that in so doing he will surely be burned. If he does put his hand into the blaze, is it not fair to ask if the training of that child was not faulty, rather than at once to arrive at the conclusion that the child was wholly to blame? In dealing with these questions I think we ought to assume

that we are dealing with a high order of animal, to wit, a man.

In considering this subject there seems to be much to be said before we come directly to the question at issue, and I wish to allude to an objection which is often raised in dealing with this and kindred subjects, namely, that it is none of our business; men and women have a right to do as they please. This is an error. Better than ever before we are beginning to realize that a man has not a right to eat, drink, and gratify his passions as he pleases. Why? Because the results of every act have some fruitage on others as well as on himself. It is the business of others that we do no violence to ourselves. We do not live a day that we do not directly and indirectly come in contact with hundreds of our fellows, and it certainly is of some concern to us how they live. In the necessities of food, shelter, raiment, travel, etc., we are constantly in close relation with others, and can it be possible that it is of no concern to us how they have labored and lived, as we enter into their labors? I tell you nay. If a man leads an unsanitary life, others necessarily are compelled to enter more or less into its fruitage. On the other hand, high and nobler living will benefit others by allowing them to enter into its good results—in this way life will be a blessing and not a curse to our race. As science utilizes the great forces of Nature for the good of mankind, so ought the transmitted tendencies of character and good health be so directed as to result in the greatest good to our fellows, and as Nature's forces are merciless when not properly controlled, so do the moral forces prove destructive to society if they are not properly directed.

Sociological transmissions affect character either for good or bad, rather than for bad alone as Shakespeare wrote, "The evil that men do lives after them; the good is oft interred with their bones." Therefore, it is of some concern to others what sort of lives we live, and we can assert without fear of contradiction that "no man liveth to himself."

In the analysis of any public movement we shall trace it through official, executive, law, legislature, to the individual, and back of the individual the unit of society, we shall find his expression in heredity and training. Again, our work as health officers is so broad that it concerns not only the physical well being of mankind but also their moral welfare; not only of the present generation, but also of future generations. We are concerned with man's moral as well as

physical welfare, because of their inseparableness. He who has good morals will be most sure of a fine physical condition. Let a man's morals improve and necessarily his physical condition will be advanced or vice versa.

Gentlemen, if these two points are accepted, first, that we can trace action to heredity and training, and, secondly, that we are concerned not only in the present man's moral and physical condition, but also in the yet unborn man, are we not compelled to ask for a sanitary marriage, through which alone the legitimate offspring of the human species are perpetuated, thus affording the best heredity, and a sanitary home for training? In these two fundamental institutions we find the root of every nuisance we have tried, or ever shall try to abate. Right here is the fulcrum for the lever sanitation where the greatest efficiency can be attained. Granted that we have a sanitary marriage for heredity, complemented with a sanitary home for training, and it requires no prophet's vision to look down the dimly lighted corridor of the future and imagine universal sanitation singing,

"Joy, joy forever! my task is done—
The gates are pass'd, and heaven is won!"

We are aware that the science of breeding stock is quite exact, and quite generally applied, so that its good results are not for a moment questioned. Much space is devoted to this department in all agricultural papers. It is never thought that the farmer's crop will differ from that which was sown, and never doubted that the quantity and quality largely will depend upon the right preparation of the soil. It is too near the twentieth century to argue that the children of the epileptic, insane, tuberculous, inebriated, cancerous, pauper, and criminal will not be prone to a like condition by the inexorable law of transmission of physical and moral traits.

If our animals are worth good breeding, it ought to be much more advantageously applied to our own species. And if the farmer finds it necessary to prepare the soil for the seed, for the same reasons should not the human soil physically and morally receive attention from the husbandman? Think of the inheritance of children born into the world unwished for by their parents, deprived of prenatal love; and also those branded as bastards, worse than fatherless, sired, damned into existence! Think of the burdens and limitations of those born with transmitted tendencies

to disease, crime, etc., besides often being a burden to society! Can we longer fail to realize that our children's highest needs demand their heritage of a good birth and health far more than wealth and position?

As an illustration of many evils of the day to which much attention is directed allow me to speak of that class of men termed criminals, numbering in our country three-fourths of a million, whose percentage of increase for the last few years is twice the percentage of the increase of population; and yet we have tried to reform them, with the result that they are being born faster than reformed.

That society may be protected, and no injustice be done to the criminal, deprive him of marriage and of propagating his kind, and society and criminal both will be benefited, with positive knowledge that the criminals will be fast decreasing. Apply the same to the drunkard and intemperance will be lessened. The same rules apply to the effectual control of the diseases whose tendencies are surely transmitted. Stock-raisers exercise much pride in the pedigree of domestic animals, and its registration, and if important here, as all will concede, much more so in the human race. Men have little to say about their pedigree and for good reasons we may suppose. Why should not a man looking for a helpmate inquire into the ancestry of the woman of his choice, and the woman on the other hand, ascertain the same concerning him who seeks her affections? Marriage is sometimes spoken of as a lottery, but it is not. If men and women will pursue lottery methods they must expect lottery results. The horse buyer investigates the personal qualities of the horse with its heredity and training and it is seldom he need be deceived; and if men and women would take time for the same inquiries and act accordingly we should not hear of lottery marriages. A man who buys a vicious horse expecting that in his hands it will prove a faithful beast will have the opportunity to add to his store of knowledge, as will the girl who marries a man of bad habits with the idea of reforming him. In the very act of marriage, she unites herself to his bad habits as surely as to the man himself.

Probably no truth is more apparent and at the same time harder for us to wisely utilize than the universal law, morally as well as physically, that "Whatsoever a man soweth that shall he also reap," and the reaping stops not with the sower alone, but affects for good or ill his posterity "even unto the third and fourth generations."

That so many babes sicken and die before budding into innocent childhood; that so many children are ill nourished, deformed, or die long before they come into life's activities; that so many men and women are cut off at the midday of life, instead of coming to life's end, as a shock of corn well ripened and garnered, is not the will of Providence. He never makes a blade of grass, flower, beast, or even man in His own image to gratify His satisfaction of cutting off such creations before their mission is fully accomplished. As so many are stricken down as a result of entering into the evil lives of their fathers, having taken on their fruitage, we must admit that it was a faulty ancestry, and while we try to make the world sanitary, let us put the real cause of effect where it belongs rather than in the purpose of Providence. A Providential death, in its right conception, is a natural death from natural causes. And so far as man can reckon these natural deaths they constitute in our country only two per cent. of the total,—in other words, two Providential deaths to ninety-eight unnatural or human-caused.

> "Know, then, thyself, presume not God to scan,
> The proper study of mankind, is man."

Is it not our province to encourage this study? I wish to emphasize a point already alluded to when I said we should be doing no injustice to the criminal in depriving him of marriage, and the same will apply to every ineligible man and woman. No sane man would withhold his gratitude from one who compelled him, in his ignorance of dynamite to cease playing with it, if he could be convinced that by so doing he would surely be killed. No one, in his sober moments, is glad of the wrong he has done, and it is safe to say that remorse follows in the wake of every wrong at some point or other in our existence; the greater the wrong, the keener the remorse. If, then, we deprive a man of a course which will not yield him that which he really wants, and at the same time protect society from the evils of such a course, we do no injustice to either, we rather incur their lasting gratitude. The boy may wish to play rather than go to school, but in after years he will thank his father and mother for compulsory education, and society will be benefited by one less idle and ignorant man than otherwise would have been.

Our aim as sanitarians, and this really includes all who are trying to make the world better, must be such legislation as

will permit of only sanitary marriages, and before this can be accomplished society must be educated to a proper understanding of this important sociological question.

For the highest good of society a sanitary marriage must be supplemented with a sanitary home,—sanitary, not only in its appointments, but also furnishing such training to children as shall enable them to come into the possession of life's highest and noblest attainments. If it is true that man is largely the expression of heredity and training, the latter must not be overlooked; for "you may bend the sapling but not the tree." Home is a sacred institution; it is the very bulwark of civilization and its citadel ought to be most carefully guarded, for if the enemy once gains entrance all other institutions are equally threatened. Many homes are ideally sanitary so far as physical conditions are concerned, such as plumbing, ventilation, light, and a sufficient number of apartments; we take pride in the progress made along this line, at the same time we have to deplore the fact that in certain quarters of all our cities many families are yet living in dark, squalid, ill-ventilated, over-crowded tenements, being unsanitary morally as well as physically. Can we expect upright living under such conditions? We must not expect too much from the inmates of these unsanitary homes. Just so long as such abodes exist they will find willing tenants. The public conscience must be aroused so that it will demand of our landlords sanitary tenements.

Let us aim for healthful abodes, not only for the physical well being of the tenants and their children which are to be reared in them, but that they may be an efficient aid to their intellectual and moral growth. Then if both fathers and mothers might be induced to take enough time from club life, unnecessary business, or pleasure, to attend to the proper education of their children in ways of industry, economy, and righteousness, what might we not expect from those who shall come after us?

Finally, that these two fundamental institutions, marriage and home, may be brought nearer the Divine ideal, thus affording the highest good and happiness to our race, we summon all who are interested in human weal and progress to expend preventative as well as reformative effort, that those who are yet to behold life's morning in its dewy freshness may be able to sight that guiding star which shall enable them to wind their way into a profitable and pleasant childhood- adolescence, and manhood, to life's meridian of noblest

activities and joys, and then, with faces turned toward life's farther horizon, shall at last find an unclouded setting, transmitting backward a halo of light and power.

THE PREVENTION OF INFANTILE DISEASES.

BY D. E. SULLIVAN, M. D., CONCORD.

The importance of this subject cannot be over-estimated. As guardians of the public health, interested in every thing tending to remove hindrances to the enjoyment of well-being, we are confronted by many problems for solution, but none can more rightfully lay claim to our earnest attention and thoughtful consideration than one whose interests are embodied in every household, blessed by the legitimate and natural consequence of matrimony.

It has been truthfully said a child's education should begin generations before its birth; let that be granted, and yet we must admit with a painful sense of negligence that very little thought is given to the proper care of a child even at its birth or during its infancy.

One is born into the world without any violation on his part—weak, helpless, defenceless—through no act of his, he becomes a living being, and often times his advent is unsought and unwelcome. Thrown in this pitiable condition upon the resources of others, himself an innocent party with the natural right to life, an ordinary amount of intelligence is demanded of those to whom he is entrusted. Sad to relate, the knowledge of the intelligent care of a baby possessed by the average mother is not very great; at times it seems she gives it no thought whatever until the actual presence of the crying infant arouses her to the situation.

During her pregnancy, she has not advised with her physician as to the best way of living to bring forth healthy offspring; has not suitably cared for her milk-secreting glands, nor sought any information for the proper direction of the new-born; she gives more time to the planning of a new house than she does to one who is bone of her bone, flesh of her flesh. It is not pleasant to dwell on this, but it is a stern fact and must be faced; the ignorance of the future mothers is appalling, and its fruits will be gathered in a whirlwind of disaster unless we of this generation do our solemn duty.

There are today mothers who never should have been wives,

—such women fill orphan asylums. There are in every town fresh graves filled with white caskets,—those infants should never have been born. Did we have the opportunity to admonish women before marriage, much of this would be avoided; but, accepting the present manner of courtship and matrimony, expectant mothers must be made to understand that the health and happiness of their children will, in a great measure, depend upon their own health. This should be popularized. They must be encouraged to make regular visits to their family physician for information of which they sorely stand in need.

It may be years before this can be accomplished, as the customs of centuries must be overthrown and the necessity of the new order proven; so, also, must the long train of false teaching, marking the course of so-called nurses, be obliterated. We have trained nurses for everything in medicine and surgery, but allow any one, no matter how incompetent, to direct the lying-in period. How we are deceived! It is so rare to find a graduated nurse who has devoted her talents to this specialty, and so common to meet the one who knows more about babies than the doctor. An ignorant, willful woman can do more harm here than in any other case; unbeknown to the mother she can, and will, dose the little one with paregoric, soothing syrup, or gin, as her fancy dictates.

She is not truthful and will not accept orders, to say nothing of obeying them; she is not reliable and when she leaves her charge its last state is very often worse than the first. The tender skin so easily congested, is forcibly rubbed during the bath, and the epithelium denuded with the usual result; the head is held sacred to the touch, and its repulsive coating of eczema is regarded with as much reverence as a kingly crown; crying is a sure sign of hunger, and more food is given only to add to its distress. Hunger is so seldom a cause of crying in a healthy infant, that the famous professor of diseases of children in a metropolitan college could be easily forgiven for thinking of every other possible source of irritation in his own child before he thought of feeding it, when that was really what it needed. Are we not remiss in our duty when we do not strongly recommend a skilled nurse for this work? At present they are few in number, but with the demand, their ranks would be filled; let there be more bright young women encouraged to help humanity by making this a study and a calling.

Will the district nurse be able to do the missionary work or will it be necessary to establish day nurseries? In the non-manufacturing cities, the former would surely be a great aid and might for the present suffice; but where, through force of circumstances, a goodly number of infants are dependent from morning until night on such care or lack of care as is given them in the mothers' absence, nothing but an especially adapted institution will avail to stay their frightful destruction.

Some of our busy cities may be blessed by these nurseries, where by competent women babies are cared for, practical demonstrations given mothers, and nurses graduated for this particular work; certainly is there an urgent need of them where so many mothers may be daily employed in the mills. Their death rate is largely increased, more particularly during the summer months, because so many infants succumb to the effects of improper feeding; this question has never received the investigation an outraged people would demand did they realize its full significance. Think of it, you guardians of the public health!

During the year 1893 in this glorious commonwealth of ours, world-famed as a natural health resort of thousands gathered from all climes, there were four hundred and twenty-three deaths from cholera infantum alone. More by a score than were caused by Bright's disease, typhoid fever, measles, diphtheria, and scarlet fever combined. Did it ever occur to you so many innocent lives were going out from among us? So many budding rays of light that in this free country might have illumined the world were so early extinguished? Its enormity grows with its contemplation. This monster eating at our very vitals, sapping the life-blood of our boasted institutions, and we almost indifferent to its presence.

Of every hundred children born, twenty-five fail to reach the fifth year. Science must have made a failure of its efforts to know much of the mysteries of what we call Life when such a slaughter of the innocents has continued, for it does not seem right that every fourth child born should necessarily die within a few years of its birth. We prevent consumption, up-root typhoid fever, isolate diphtheria, preach hygiene, and undoubtedly lengthen the term of man's existence in many other ways, but at the threshold of life, at the cradle, we are powerless. It is only a baby you say, but ask that father, that mother, and you will find to them that baby is dearer than all else in the world.

For some time I have believed boards of health should prepare printed information on the care and proper feeding of infants and place a copy of it in the hands of every mother in the state; when we are made registrars of vital statistics, as becomes us and as our legislature should authorize us, it will be an easy matter on the receipt of the birth certificate to forward such instructions to her. Thereby she would learn of the many dangers lurking in a feeding bottle, daily exposing her child to sickness and death; she would plainly see that her baby's safety is paramount to her own convenience and social pleasures; she would be told the stupendous fatality of artificially fed babies over nursing babies, that as collected by one investigator, out of 1,940 deaths in infants 1,879 were bottle-fed.

We know some women cannot possibly nurse their children; we know others who can but should not be allowed to nurse them; for these two classes a substitute for the breast must be provided, but for all others, the natural way is the proper way and should be insisted upon,—no excuse should be thought sufficient to release them from the birthright claim of the child. Diseases of the gastro-intestinal canal cause such a large proportion of infantile deaths and these diseases are so often due to improper feeding, it behooves us in every case where a nursing bottle is used to emphasize the necessity of absolute cleanliness in every thing connected with the feeding, and the importance of regular feedings in definite quantities. To vomit after every meal is not a badge of perfect health, nor is continued crying a requisite to good digestion. I believe I am within bounds when I say not one woman in twenty in our state today is giving her baby the benefit of scientific and hygienic methods of feeding. In the midst of plenty is starvation; with a stomach full of food, comes death from inanition. That mother who underfed her baby is not to be found, but the over-fed infant is everywhere present.

It is so difficult to convince people that there is a limit to digestive powers that even in the face of repeated remonstrances they continue to make miserable the child's existence; not alone with food proper and digestible of itself, but also with all kinds of indigestible things,—it not uncommon to see a two year old eating grapes, peanuts, and unripe apples. It may yet be necessary to regulate by law, as France has, the feeding of infants in so far as prohibiting the giving of solid food to those under one year of age. But

did mothers know the fatal dangers attending it, no law would be necessary to restrain them; they know not what they do and to us they are a sacred trust to be religiously guarded.

If due attention be paid to the milk and its source, it will seldom be necessary to use any of the numerous baby foods so extensively advertised; good cows' milk properly given is the best artificial food for an infant,—all these foods are imitations of it. Tuberculosis in the child has been traced to the cow supplying the milk, and is perhaps the only strong objection to that animal as a source of infants' food; but the more general use of tuberculin would remove that, and it is pleasing to relate that many dairymen have, of their own accord, within the past few years submitted their herds to this test. They have anticipated the duty of the state, but by legal enactments should be compelled to protect the interests of these weak subjects.

With desolation is the land made desolate even in this day of advanced science, when we are well-nigh overwhelmed by the practical progress made in our glorious profession; parents do not know that whooping cough has in the past ten years caused more deaths in this state than measles, and that in some countries it ranks third in the fatal diseases of infancy; they do not seem to understand that teething is a physiological process, or that teeth are necessary for mastication; neither do they value the dangers to vital organs after scarlet fever, nor recognize the meaning of growing pains with their tendency to heart lesions.

Towards the poorer classes more particularly must our efforts be directed; they cannot recompense nurses, but the daily or occasional visit of a district nurse would be to them a bright gleam of sunshine, and no one can say how many blessings would follow from it. Early impressions are lasting. The day has gone by when "the good men do is oft interred with their bones." The kindness of today may years hence arise as sweet incense to ease declining years.

Can we turn our thoughts to a more humane subject than that of the alleviation of an infant's suffering and the prevention of its untimely death? The world abounds with weeping Niobes, comfortless and refusing to be comforted because their cherished ones are no more; few are the homes not hushed by the reflections of those prattling lips forever stilled.

Shall we pass by on the other side, or pause, bind up their wounds, pouring in oil and wine?

Let us suffer little ones to come to us; fight their battles with all our strength of mind and body; lend our aid to bridging over these few first years of life and at all times in the presence of infancy, remember we too were like unto them.

In behalf of those mourning women and afflicted firesides, in defense of suffering baby-hood struggling for an existence, and in the name of the myriads of unborn, the appeal goes forth asking us to earnestly and faithfully strive to rectify the failures of ages, to suspend that fatal sentence decreed before birth, and to hasten the day when the iniquities of the parents shall not descend on the innocent.

SOME OF THE RIGHTS AND DUTIES OF LOCAL BOARDS OF HEALTH.

BY IRVING A. WATSON, M. D., SECRETARY STATE BOARD OF HEALTH.

The law of this state provides that towns may elect health officers or they may be appointed by the selectmen. In the event that they are neither elected nor appointed, the board of selectmen must serve as a local board of health. As a matter of fact the latter is the case in many of the smaller towns of the state. Our system of choosing health officers is entirely wrong, and but for an oversight in the matter of a hearing before one of the senate committees at the last session of the legislature, would undoubtedly have been changed so as to provide for a board of three in every town, with a tenure of office of three years, the term of one member expiring annually. Such a law would provide for a practically continuous board, and thereby add to its efficiency. As it now is, local health officers are not infrequently changed each year, or, in other words, go out of office at just the time when, through a year's experience and study, they are becoming qualified to fill the position in an intelligent and capable manner. It is to be hoped that a change in the law, in the direction indicated, may be effected at the next session of the legislature.

But it is my mission at this time to discuss certain features connected directly with the work of the local health officer, rather than to generalize.

My experience of several years in public health work in this state has demonstrated that, notwithstanding all the inherent defects of our public health laws, the sanitary

progress of the state has been most marked and of inestimable value to the people of New Hampshire. Step by step has the advancement been made, and the evidence of it may be seen on every hand. The introduction of public water-supplies in all our cities and in many of our towns and villages, to take the place of the typhoid-producing wells; the cleaning up of our streets, alleys, and even of individual premises, by abating offensive conditions which but a few years ago were to a large extent ignored; better ventilation and lighting of our school-houses and other public buildings; the careful supervision of our many charming summer resorts, thereby preventing the outbreak of dangerous infectious diseases, and, as a consequence, not only saving life, but adding immensely to the wealth and prosperity of the state; the securing of better sanitary conditions at the railway stations and public camping grounds; the direct supervision of certain contagious and infectious diseases, thereby greatly reducing their ravages; and the educating of the public in matters pertaining to the hygiene of the home and the individual. Indeed, it would be superfluous to undertake a statement of the almost unparalleled progress that sanitation has made in our commonwealth in a single decade, all of which not only contributes to a lessened amount of sickness and a decreased death-rate, but directly and indirectly to the sum total of human happiness and prosperity.

Within a few years the position of health officer has assumed a place in the public estimation more in keeping with its true importance than it formerly held, because the value of the work that is and may be accomplished by a board of health is better understood by the community. Every health officer should regard his position as one of honor and trust, ever bearing in mind that he owes to the public a fearless, impartial, and independent performance of the many duties devolving upon the office. Moreover, he must become a student of hygiene and sanitation, to a certain extent at least, in order to possess an intelligent understanding of the best methods to be employed in certain cases. In addition to the instructions issued by the state board of health, he should take one or more reliable sanitary journals; education, sound judgment, and discretion are almost invaluable adjuncts to the qualifications of a health officer.

As soon as a board of health is legally constituted, it should perfect a permanent organization by choosing at

least a chairman and secretary, and under some circumstances it may be deemed advisable to select an executive officer to carry out such work as the board may direct. This is provided for by ordinance in some, if not in all, of the cities.

A record should be kept of everything that is done by the board, especially since, in the event of legal complications, such a record would be invaluable.

The law provides, but leaves it optional, that a board may make regulations for the removal of nuisances, the restriction of contagious and infectious diseases, and such other regulations as may be deemed necessary for the protection of the public health, said regulations going into effect when approved by the selectmen, recorded by the town clerk, and published in a newspaper printed in the town or posted in two or more public places.

A willful violation of such regulation may subject the offender to a fine of ten dollars for each offence. In the judgment of the writer, every board of health should issue a set of regulations for their respective towns, based upon such rules as have been found to be beneficial in their vicinity or in other localities. Such regulations have the force of law and contribute considerably towards the sanitary education of the people in drawing attention to those things which constitute nuisances and which are inimical to good health and personal comfort.

There seems to be some ignorance among boards of health as to their powers and duties in many instances. It should be distinctly borne in mind that a board of health is an organization created for the purpose of accomplishing the greatest amount of good possible in the direction of public health in the locality in which it has jurisdiction. To that end, no board should supinely wait for petitions, or be urged to action only when crowded by some pressing complaint of a grievous nuisance. The law distinctly states that health officers of towns, and each of them, shall inquire into all nuisances and other cause of danger to the public health, and that whenever they shall find conditions injurious to the public health they shall take immediate action in the case. The idea is too often entertained that health officers must wait for complaints before doing any sanitary work.

Another error is that complaints must be made in writing; but such is not needed. It is only necessary that a board of health should know of the existence of some nuisance or condition, no matter from what source the information comes. It is then their duty to act promptly and efficiently.

The power conferred on a board of health by the Public Statutes of the state is large, but that which is given it under common law is still wider in its scope.

In the matter of dangerous or offensive nuisances the health officer may, with a warrant which can be obtained from any justice of the peace, enter any building or enclosure, and in the day time may forcibly enter, if necessary. He has the power to direct the owner or occupant of any building or enclosure to destroy the nuisance or thing deemed to be injurious to the public health within a limited time, and in case such order is not complied with the health officers may enter forcibly, if necessary, and cause the nuisance or thing offending to be removed or destroyed. If necessary, the health officer may employ assistants and laborers, and, if resisted, has the same power as a sheriff to command assistance, while any person willfully resisting is liable to both fine and imprisonment.

In case it becomes necessary for the health officers to act themselves in causing the destruction of a nuisance after the occupant or owner has been legally notified and refuses to act, an action to recover the costs of the removal of the nuisance or thing, including the fees of the health officer, may be brought and maintained in the courts.

Sect. 8 of Chapter 108 of the Public Statutes of New Hampshire reads: "No person shall occupy, lease to any other person, or permit any other person to occupy, a building or any part of a building, within the compact part of a city or town as a dwelling-house, office, store, shop, or sleeping apartment, unless such building shall be provided with suitable privies and vaults properly ventilated and constructed, and kept in proper sanitary condition, and in case of occupancy as a dwelling-house, unless it shall be provided with suitable drains or sewers for conveying the sink-water away from the premises into some public sewer, if there be one within one hundred feet thereof, and if not, for conveying it away under ground or in some other way that will not be offensive."

The requirements of this section of the law probably give local health officers more trouble than all of the other conditions with which they are brought in contact. Certainly this is true of many of our towns and villages. The sewering of our cities and of some of the larger towns has relieved the health officers in those localities of the difficulties which otherwise would come up in this connection. Every health officer probably has more than once been called on to abate

filthy out-houses and to suppress offensive cess-pools and sink-drains, and the perplexities that arise from such causes are many. The law provides that privy vaults and sinks within one hundred feet of the public sewer shall be connected therewith. It is not a difficult matter to enforce this portion of the law, but the trials come in maintaining these troublesome adjuncts to civilized life in such a condition as not to be offensive to the public or to persons living in the vicinity.

While it is expected that a board of health shall be sufficiently well informed in matters pertaining to sanitary science to be able to give advice when sought on the best means of disposing of sewage, the board is not legally required to provide means for the disposal of waste matters; that duty belongs solely to the owner or occupant of the premises. The men who conducted his sink drain to the gutter of the street and then asserted it was the duty of the town to take care of it, was wholly in error. A town is not obliged to furnish means for the disposal of sewage or sink water. When a vault, cess-pool, or sink-drain is offensive and constitutes a nuisance, it is the duty of the health officer to compel the owner or occupant of the premises to take care of these things, in such a way as to effectually abate the nuisance; and in case of a sink drain the law specifies that the offensive water shall be conducted away under ground or in some other way that will not be offensive. Not infrequently has a demand been made on a public health officer to construct a sewer for the purpose of draining or sewering a given locality. Such a demand can carry with it no executive action on the part of the board of health, inasmuch as the latter does not have power under our laws to build a sewer or to order its construction, that matter resting entirely with the town or with the board of selectmen. Because a sewer does not exist or cannot be immediately constructed in a given locality does not relieve the health officer of the duty of keeping said locality in as good sanitary condition as possible, even although to secure such the people residing therein, may be greatly inconvenienced.

There is a class of nuisances with which health officers have to deal, not so frequently as in the case of those just mentioned, but of greater magnitude individually, and that is offensive trades, such as slaughter-houses, tanneries, places for trying tallow, soap factories, fertilizing establishments, etc. These nuisances give the health officer a great

deal of concern, for the reason that a legitimate business, in which more or less money has been invested, is behind the nuisance, and the abatement of which sometimes requires the closing up of the business, and in that way seriously affects manufacturing rights. In this state the law specifically prohibits the use of a building or place near a dwelling house or school-house in the compact part of a town, for a slaughter house, a place of deposit for green pelts or hides or for trying tallow, curing leather, or for carrying on any business offensive to the people, without a written permission from the health authorities of the town, under a penalty of ten dollars for each month. The board of health may grant permission to continue the business under such restrictions as will prevent the creation of a nuisance, but in case the conditions imposed are not complied with, the permission may be withdrawn at any time, and the board of health may, if it deems it advisable, order the discontinuance of the use or occupancy of the buildings or place within a given time, under a penalty of five dollars a day for neglect or refusal to comply with the order.

While the Public Statutes confer explicit police powers in these matters upon the board of health, it is not always best to take summary action against the offending parties in the manner indicated. Most, if not all, of them constitute a legitimate business when properly conducted. It is not, therefore, the business itself but the manner in which it is conducted that constitutes the nuisance. Every citizen has the right to carry on a legitimate business, if it does not interfere with the rights of the people in the vicinity.

In the abatement of nuisances of this character, with property rights to a greater or less extent involved, it would probably be better to proceed with some other method than by the summary action of the board, under the provision of the Public Statutes. It would probably be better to enter a complaint against the offending party for maintaining a nuisance, and carry the case directly into court, or to bring a bill in equity and seek to restrain the offender by an injunction.

Precedents are already established by the supreme court of New Hampshire, one of the later cases being Cochrane v. Phillips. The complaint was against a slaughter house located on the outskirts of the village of Littleton, and the evidence in the case showed that it was maintained in a filthy and offensive condition. The testimony was direct and positive to this effect. The petition for an injunction

was brought before Justice Allen of the supreme court, who decreed as follows:

"It is ordered and decreed that the slaughter-house complained of and described in said petition, is a nuisance, and that it be abated; that the further use of the said buildings of the said Phillips described in said petition as a slaughter-house be discontinued, that there be no deposit of animal and vegetable matter liable to decay and become offensive, or the refuse of slaughter-houses and of the butchering on or about said premises; that swine shall not be kept or pastured in or about said buildings in such numbers or in such manner as to cause odors offensive to persons dwelling in the vicinity thereof, or to make the waters foul in the stream described in said petition; that the said Phillips remove the manure, refuse, and animal matter under and about said slaughter-house, which is liable to make the atmosphere offensive or to foul said waters and that he make no other use of the premises which shall make them offensive to those dwelling in the vicinity on account of foul odors, or which shall make said waters foul and unwholesome; that the said Phillips shall not suffer or permit his agents, employees, servants, or lessees to do anything on the premises or make any use thereof contrary to the orders aforesaid; and that the said Phillips pay the plaintiff's costs taxed at twenty-seven dollars and seventy-seven cents, and the cost of the copy and service of this order."

There is another point upon which health officers sometimes go astray and which is emphasized in the decision just quoted, and that is in taking the position that certain discomforting odors are not injurious to health and therefore their abatement is beyond the powers of a local board of health. The law takes cognizance of trades and conditions offensive to the senses and declares them to be nuisances coming within the abatable province of a board of health. It is not necessary to prove that such nuisances are dangerous to the health of the people residing in the vicinity.

The state makes provision for the protection of public water supplies, in that it imposes a fine or imprisonment or both upon any person placing or leaving any substance that may cause the water to become impure, in or near any pond, lake or other body of water, or other source from which water is taken for the domestic purposes of a city, town or village. It is the duty of health officers and water commissioners to enforce this provision of the law. The Public

Statutes go further in this direction, by providing that the local board of health may cause any water-supply to be examined by a competent chemist, when it has reason to believe that such water is polluted by sewage or other matter dangerous to the health of the people using it. This confers authority to make examinations of individual wells that may be located in what would appear to be a dangerous proximity to sources of pollution. If the analysis shows the water to be dangerously polluted, the health authorities may permanently close the well, upon obtaining permission so to do from the state board of health.

It is not the purpose of this paper to discuss the very important duties of local boards of health in the restriction and prevention of contagious diseases, through isolation, notification, disinfection, etc., but rather to call attention to local conditions with which every board of health is brought in contact. There is one matter in which every member of a board of health and every health officer is personally interested, and that is the question of compensation for duties performed. It should be borne in mind that a board of health or a health officer is as distinctly a public official as the board of selectmen or the town clerk, and that they are entirely independent in respect to matters legally coming within their jurisdiction. Many boards of health, especially in the smaller towns, assume that they are under the direction, to a greater or less extent, of the board of selectmen, which assumption is entirely erroneous. The board of selectmen has no control whatever over the action of a local board of health. Some boards of selectmen, however, in some instances assume to control the action of the local board of health, and to fix the compensation of the same. The law provides and states distinctly that local health officers "shall be paid by the town a reasonable compensation for their services, and all expenses incurred by them in the performance of their duties." Under this provision of the Statutes, a health officer should keep a detailed account of his expenditures, and of the time employed in the execution of his official duties, and should charge a reasonable fee or per diem for the same, and should render such account to the town in precisely the same manner as are the bills of the other town officers, like, for instance, the board of selectmen.

The practice of paying a health officer a given sum to the amount of twenty-five dollars, as has been done in certain towns in this state, is little short of an insult to the integrity

of the officer, and a reflection upon the intelligence of the community. A health officer should faithfully and impartially perform whatever duties belong to his position, and he should receive reasonable compensation for the same, whether it be much or little.

Dr. Watson, Mr. President: I move that the thanks of the association be extended to Dr. Abbott for the able and interesting paper which he has read before us. Carried.

Dr. Rogers, Mr. President: I move that the thanks of the association be extended to Dr. Watson for the timely and valuable exhibition of the lamp for the generation of formic aldehyde gas which he has presented today. Carried.

Dr. G. P. Conn, Mr. President: I move that the papers here presented, together with the discussions, be referred to the state board of health, that the secretary may use them to the best advantage. Carried.

Dr. G. P. Conn, Mr. President: I am informed by Dr. Abbott that he has with him quite a good number of copies of Dr. Russell's paper on the Prevention of Tuberculosis in the Human Being, which he would be glad to present to the members of this association. I move that we accept them, and extend a vote of thanks to Dr. Abbott for his kindness in bringing them to us. Carried.

Adjourned to meet at the call of the Executive Committee.

Following is the list of officers of the association:

OFFICERS 1896–1897.

President. Dr. GEORGE COOK, Concord.
First Vice-President, Dr. C. W. DOWNING, Manchester.
Second Vice-President, Dr. D. M. CURRIER, Newport.
Secretary, Dr. IRVING A. WATSON, Concord.
Treasurer, Mr. E. N. PEARSON, Concord.

EXECUTIVE COMMITTEE.

Dr. JAMES T. GREELEY, Nashua.
Dr. FRED S. TOWLE, Portsmouth.
Dr. TRISTRAM ROGERS, Plymouth.
Dr. E. F. HOUGHTON, Rochester.
L. POPE, JR., M. D. V., Portsmouth.
Dr. C. S. COLLINS, Nashua.

CONSTITUTION.

ARTICLE I.

TITLE.

The Association shall be called "The New Hampshire Association of Boards of Health."

ARTICLE II.

OBJECTS.

The objects of this Association shall be the advancement of sanitary science in the State of New Hampshire, the promotion of better organization and co-operation in the local boards of health, the uniform enforcement of sanitary laws and regulations, and the establishment of pleasant social relations among the members of the Association.

ARTICLE III.

MEMBERS.

All persons holding appointments as members of a board of health in a New Hampshire city or town, the executive officer of such a local board, and the members of the state board of health, and such other persons as may be elected, shall be eligible to membership.

All applications for membership shall first be reported upon by the executive committee, and after a favorable recommendation by the committee, the votes of a majority of the members present and voting, shall constitute an election.

Provided, that for organization all persons eligible to membership shall be considered as members of the Association upon application before April 1st, 1897.

ARTICLE IV.

OFFICERS.

The officers shall be a president, a first and second vice-president, a secretary and a treasurer.

The officers shall be elected annually at the annual meeting.

ARTICLE V.

PRESIDENT.

The president shall perform all duties usually performed by a presiding officer.

ARTICLE VI.

VICE-PRESIDENTS.

The vice-presidents shall perform the duties of the president in his absence.

ARTICLE VII.

SECRETARY.

The secretary shall keep the records of the meetings, have charge of the correspondence, send out notices, and act as clerk for the executive committee.

ARTICLE VIII.

TREASURER.

The treasurer shall collect the dues of the members, have charge of the funds of the Association, and pay all bills, subject to the order of the executive committee.

ARTICLE IX.

EXECUTIVE COMMITTEE.

The executive committee shall consist of (1) president, the first and second vice-presidents, the secretary and treasurer;

(2) of six members, three of whom shall be elected annually for a term of two years, (3) and the past presidents of the Association.

It shall be the duty of the executive committee to consider and recommend plans for promoting the objects of the Association; to authorize the expenditure of all money by the treasurer; to consider applications for membership, and at the regular meetings report the names of such candidates as a majority of the committee may approve; to superintend the interests of the Association and perform any duties which may be committed to them by the Association; to call the meetings of the Association and to direct the secretary to send out notices of the same.

To facilitate business the executive committee may appoint sub-committees from its members and may give to such sub-committee the authority to act for the whole committee. Five members shall constitute a quorum of the executive committee.

ARTICLE X.

COMMITTEE ON SCIENTIFIC PAPERS AND PUBLICATIONS.

The committee on scientific papers and publications shall consist of the secretary and two active members, selected by the executive committee. It shall be their duty to solicit and provide scientific reports and papers to read at the meetings of the Association, and all such papers must be approved by them. It shall also, when so directed by the executive committee, make the necessary arrangements for the publication of scientific papers, reports, etc.

ARTICLE XI.

MEETINGS.

All meetings of the Association shall be held at the call of the executive committee. (1) There shall be held at least two regular meetings a year, the dates of which may be fixed by vote of the Association or by the executive committee. The annual meeting shall be held in the City of Concord.

(2) Special meetings may be called by the executive committee. The secretary shall give due notice in writing to all members of every meeting.

ARTICLE XII.

DUES.

The annual assessment shall be two dollars, and shall be collected by the treasurer from all members. All members whose dues remain unpaid for a period of six months, shall, after that date, be dropped from the list.

ARTICLE XIII.

QUORUM.

The representatives of six boards of health shall constitute a quorum.

ARTICLE XIV.

ORDER OF BUSINESS.

The order of business shall be determined by the executive committee.

ARTICLE XV.

CHANGES IN THE CONSTITUTION AND BY-LAWS.

Changes in the constitution may be made at any regular meeting, written notice of the same having been given at the preceding meeting, by vote of two-thirds of the members present.

NOTES ON THE SEWERAGE FOR THE CITY OF ROCHESTER, N. H.

BY ERNEST W. BOWDITCH, C. E., BOSTON, MASS.

In 1888 plans were prepared for sewage collection systems for the three villages of Rochester. Sections and profiles were drawn, and the ground was very fully examined to determine the most desirable routes for trunk sewers and outfalls.

The villages being so remote, one from another, three independent systems were required, with the possibility of extending the Rochester trunk through Gonic to the Gonic outfall, thus saving the Cocheco river from pollution above that point.

Careful calculations were made of the areas in each district to be sewered, resulting in allowing for the future populated area of 520 acres for Rochester Village, East Rochester 140 acres, and Gonic village 70 acres.

It was decided to advise the separate system of sewers in each case as this would give the required relief in a less expensive way for the city than any combined system.

Trunk sewers were figured to run full and to be of sufficient carrying capacity to care for the population till 1948.

A temporary outlet of the Rochester system was suggested at Walker's bridge over the Cocheco river and the permanent outfall was planned to be in the river below Gonic Village. The system using this outfall comprised about 12 miles of pipe varying in size from six to eighteen inches in diameter.

The village of East Rochester was figured in the same manner and called for about two and a half miles of pipe varying in size from six to twelve inches in diameter.

The system for the village of Gonic was designed to use the

same outfall as the Rochester trunk sewer, and included a mile of pipe varying from six to eight inches in diameter.

CONSTRUCTION.

In the years 1891-'92-'93, lateral sewers were laid in Rochester and East Rochester by the city authorities without the supervision of this office, but according to its plan.

A portion of the East Rochester section was laid by Messrs. Gowing & Moore of Boston. The first work in Rochester proper was given to Joseph Bruno, the lowest bidder, who, however, laid but a short length of sewer before the volume of ground water became troublesome. He became alarmed at the prospect, and, not knowing how to handle the water, abandoned the work, left the city without refilling his trenches, forfeiting his bond of $3000. (The city authorities in 1895 returned one-half of the amount of his bond to Mr. Bruno.)

In 1893 a contract was let to Bartlett, Gay & Young, of Manchester, who completed all laterals then needed in Rochester, and also laterals in a number of streets in East Rochester.

In 1893 the Gonic Manufacturing company made a complaint to the city council, objecting to the use of the Cocheco river at or near Walker's bridge, as a temporary outfall for the disposal of the sewage of the city and objected to the use of any and all points above their mill and dam, threatening to have an injunction issued if the trunk sewer was used without extension. This caused the city the additional expense of building the permanent outfall, as originally planned below the Gonic Manufacturing company's dam.

The route of the main sewer near Gonic, as planned, was considered very injurious by the railroad company, it being located for some distance on its property, and, on being consulted, the committee thought some other route might be found which would be just as convenient for the city and less objectionable to the railroad company.

Trial lines were run, therefore, to determine the most feasible route for the trunk sewer, from the temporary outlet, as built, to the point below the Gonic dam on a location satisfactory to the railroad company.

Both sides of the Cocheco river were examined between the points mentioned, and five different routes were surveyed for the practicable location of the outlet where it would be possible to reconcile conflicting interests.

It was finally shown that the route as built via Charles street to the B.& M. R. R. Northern division, and by the westerly line of said railroad to Gonic station, and thence by private land in a southwesterly direction, crossing Winter and Maple streets to the Cocheco river below the Gonic Manufacturing company's lower dam, would be the shortest and least expensive route by which to build to a point where no objection would be made.

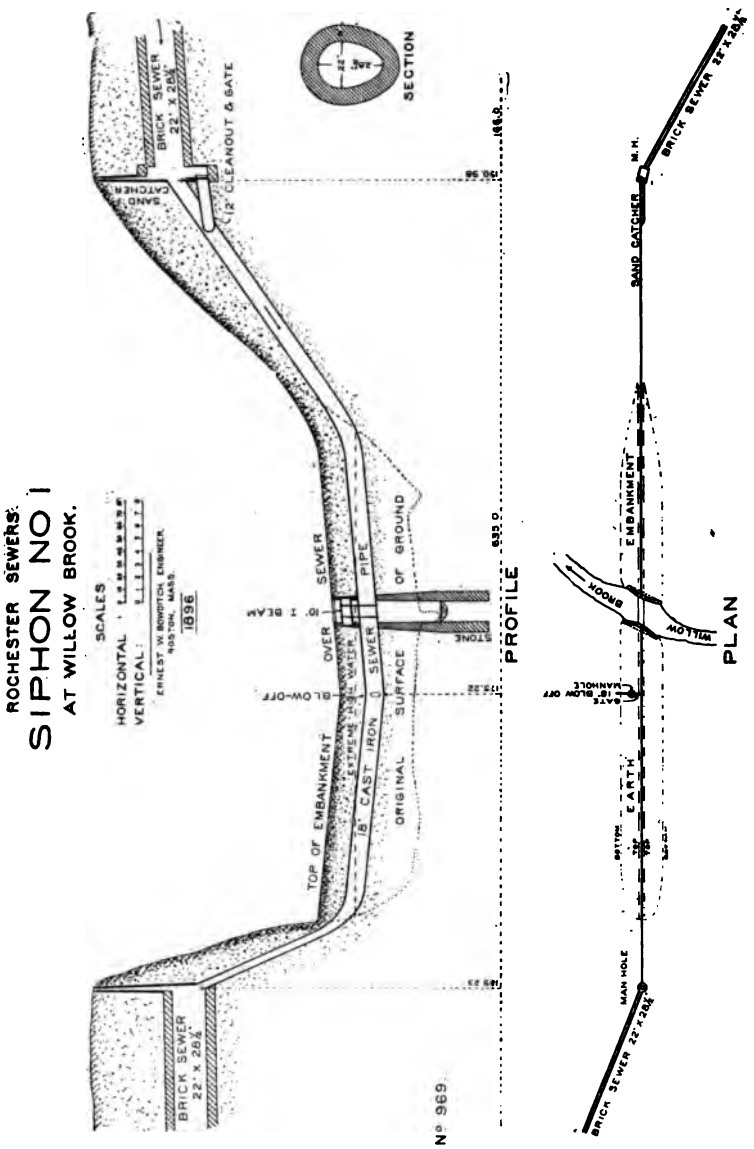
Professionally, it was regretted that the sewer could not have been built through Gonic Village, instead of on its present location to save multiplying the number of pipes.

Estimates were made and presented to the city council for the line through Gonic, and, while it was shown that this route was only 400 feet longer, it was found that the excessive amount of cutting in the trenches, and the difficulty in crossing the river at that point. would cause additional expenditures over those contemplated on the route selected of about $12,000, which amount would be enough to build an independent system of sewers in Gonic Village, when called for, providing a so-called separate system.

It should be stated that a system of intermittent filtration was suggested, and surveys made for Rochester proper, locating the disposal field near Willow Brook. The nature of the soil, however, was not what is required to secure the best results, and it was found that the cost of such disposition of the sewage of the city together with what surface water entered the sewers, would be far in excess of what had been hoped So the filtration scheme was abandoned as being too expensive.

On July 6th, 1894, an approximate estimate was made of $33,000 for the building of the outfall sewer and the materials to be used in its construction. The city council thereupon appropriated $32,000 for the work.

August 11, 1894, proposals were received for the labor involved in the building of the sewer and for the materials to be


ROCHESTER SEWERS.
SIPHON NO 1
AT WILLOW BROOK.
SCALES
HORIZONTAL
VERTICAL
ERNEST W. BOWDITCH, ENGINEER
BOSTON, MASS.
1896
PROFILE
SECTION
PLAN
BRICK SEWER 22" X 28"
SAND CATCHER
12" CLEANOUT & GATE
TOP OF EMBANKMENT
18" CAST IRON SEWER
ORIGINAL SURFACE
BLOW-OFF
10" I BEAM
SEWER PIPE
OF GROUND
STONE
EMBANKMENT
BROOK
WILLOW
MAN HOLE
EARTH
No 969.

furnished. There were fourteen bidders on the labor, the highest being Messrs. James Heath & Son of Lynn Mass., their figure amounting to $30,360; the lowest were Morgan & Booth of Trenton, N. J., their figure amounting to $11,588. The bid next to the lowest was given by Daniel O'Connell of Holyoke, Mass., his figure amounting to $11,939.50.

For furnishing castings, Osgood & Hart of Charlestown, Mass., were found to be the lowest, their price being $6.10 per set of man-hole frames and covers weighing 525 pounds, delivered on the work.

On the bids for furnishing cast-iron pipe, the Warren Foundry & Machine Company of Phillipsburgh, N. J., and Lester, Wood & Co. of New York City, were found to have put in the same prices of $23.50 per ton of 2200 pounds.

The brick manufacturers of Rochester gave two prices for furnishing brick, $5.50 and $7.50, depending on quality.

Charles W. Bradley, of Rochester, was found to be the lowest bidder for cement, with $1.28 for Rosendale and $2.53 for Portland.

The council took the bids under advisement, and, on August 20, contracts were awarded as follows:

Labor, to Morgan & Booth, Trenton, N. J.

Man-hole castings, to Osgood & Hart, Charlestown, Mass.

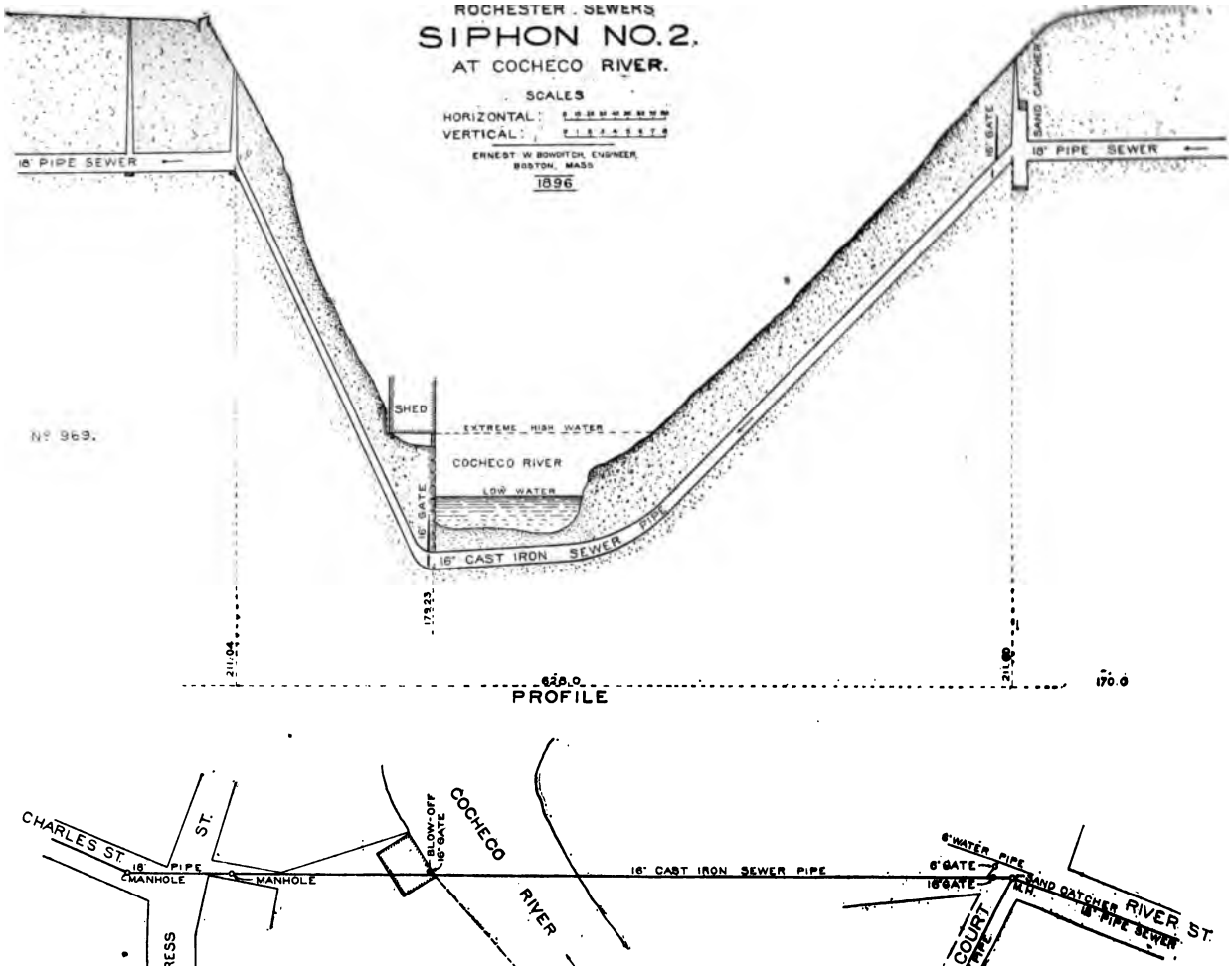
Cast-iron pipe, Warren Foundry & Machine Co., Phillipsburgh, N. J.

Cement, to Charles W. Bradley, of Rochester, N. H.

The contract for brick was divided among the brick manufacturers in the city at a price of $6.10 per thousand.

Morgan & Booth began work on the outfall August 27th, 1894, and continued without interruption until December 19th, when they finished and their work was accepted by the sewer committee. The expense of constructing the outfall sewer was $30,000.

A plan and profile of a part of the sewer and siphon, over Willow brook, showing a section of the brick sewer, the sand catcher, bridge crossing, and blow-off for flushing the siphon, is shown, it being in some ways different from ordinary practice, and yet, fulfilling all requirements satisfactorily.


ROCHESTER . SEWERS
SIPHON NO. 2.
AT COCHECO RIVER.
SCALES
HORIZONTAL:
VERTICAL:
ERNEST W. BOWDITCH, ENGINEER,
BOSTON, MASS
1896
18" PIPE SEWER
SHED
EXTREME HIGH WATER
COCHECO RIVER
LOW WATER
16" GATE
16" CAST IRON SEWER PIPE
16" GATE
SAND CATCHER
18" PIPE SEWER
Nº 969.
211.04
173.33
628.0
211.8
170.0
PROFILE
CHARLES ST.
18" PIPE
MANHOLE
MANHOLE
ST.
BLOW-OFF
16" GATE
COCHECO
RIVER
16" CAST IRON SEWER PIPE
6" WATER PIPE
6" GATE
16" GATE
SAND CATCHER
RIVER ST.
18" PIPE SEWER
COURT

In 1895 the construction of sewers at East Rochester was continued. The city engineer had previously built one section as a combined system, and, according to the wishes of the sewer committee, a new sewerage plan for East Rochester was drawn and a combined system of sewers figured out, with sizes of conduits varying from eight inches to two feet in diameter.

Twenty-two thousand dollars was appropriated by the city council for additional sewers at East Rochester, and they were built in the more thickly settled parts of the village. Of this amount, 1800 feet were built of brick, oval shaped, as in previous years.

In 1896 a siphon was built across the Cocheco river at Rochester Village, so as to intercept the sewage from the west side of the village (which then ran, indirectly, into the river), and joining it to the trunk sewer previously built at the centre of Rochester Village, thus keeping crude sewage out of the river. This siphon of cast-iron pipe is somewhat similar to the one built on the outfall sewer; it is 620 feet long, and the difference in level between the top and bottom of the siphon is about 32 feet. The pipe is of 16 inch cast iron and has a 16 inch gate for a blow-off at the lowest point in the river.

The possible location of this siphon gave a decided advantage as there was an opportunity to connect the inlet end of the siphon directly with the six inch water main, giving opportunity to use the water pressure of the city for a thorough flush of the siphon, without resorting to the gate at the blow-off, which gate, however, is liable to be needed if the sewer be improperly used.

In 1894 a great deal of dissatisfaction was expressed by the people of Rochester regarding the method of sewer construction in past years, and the excessive quantity of ground water making its way into the pipes.

It is to be understood that, in certain sections, very much more ground water finds its way into the sewers than need be. Its presence in large volumes is to be regretted because it reduces the sewage carrying capacity of the pipes very considerably, and, should it be necessary at any time in the future,

to treat the diluted sewage chemically, or on filter beds, the cost of doing so would be much increased, owing to the enormously greater volume of liquid to be treated.

In certain sections of the city, the volume of ground water is many times greater than the volume of sewage received from the same areas.

It is, of course, impossible to prevent entirely the leakage of ground water into sewers, particularly earthen pipe sewers that are glazed inside and out, because the cement used in making the joints does not cling to a glazed surface so as to make an entirely tight joint; a system of so-called underdrains, however, laid with open joints, for the express purpose of collecting soil water, and laid on a lower level than the sewers, will always reduce the trouble arising from ground water and reduce the amount of leakage into the sewers to a minimum.

Proper ground water drains, discharging at intervals directly into the river, would have been easy to arrange, but they were not considered necessary by parties having charge when the earth-work was done and now, it would be practically impossible to lay such conduits without virtually reconstructing those sections—a process at once too expensive to seriously consider.

REPORT OF CATTLE COMMISSIONERS.

To His Excellency the Governor and the Honorable Council:

In accordance with previous action, the report of the State Board of Cattle Commissioners of New Hampshire is herewith submitted to your honorable body.

The work of the Board during the years 1895 and 1896 for which period this report is made has mainly been devoted to the suppression of bovine tuberculosis, a disease not new to New Hampshire, but one receiving increased attention during recent years, on account of a better knowledge of its nature and a more definite understanding of the conditions effecting its development, as well as of the danger arising from it. These are facts which have been prominently placed before the people in various ways, yet we are of the opinion that the importance of preventative measures in the suppression of bovine tuberculosis has not been given due prominence. In medical practice much importance is attached to preventative measures in warding off contagious and other diseases, and the practice of veterinary science, although comparatively young in this country, recognizes the same general principle.

Disease in the animal kingdom is not known until its effect has been made noticeable by the appearance of the animal, and consequently has become more deeply seated. This emphasizes the necessity of adopting preventive measures and enforcing the most strict sanitary regulations in the management and control of the domestic animals and the sooner efforts are vigorously directed in this channel, the sooner will there be less disease among animals. The diseases which

affect the animal kingdom, as well as those which are found in the human race, are largely preventable, and even those of a contagious character depend to some extent upon the surrounding conditions to propagate their kind. Tuberculosis is a contagious disease of this nature and is a disease that has existed in a greater or less degree in nearly all countries of the world where there are inhabitants. Bovine tuberculosis, which is the form affecting animals, has existed for ages among domestic animals of the same countries and will continue to exist in some degree as long as animals are reared and fed, and as long as consumption is known to the human race and the consumptive patient allowed to mingle with the rest of the world. This will probably be to the end of time, for no law will ever be enforced preventing it, however harmful the results may be. The most important action to be taken, both in regard to the human and the bovine race, is to establish and enforce such sanitary measures as appeal to the good judgment of those best informed upon such matters and in the case of the latter, break up and destroy the hotbeds of disease by disposing of tuberculous animals. The latter provision, however, is of secondary importance compared with the sanitary restrictions to be enforced.

It is not our purpose to enter into a lengthy scientific discussion of the nature and characteristics of bovine tuberculosis, for this matter is already quite well known. There are some things about this disease that are not yet well understood, even by scientific experts, but we should divest our minds of the idea that bovine tuberculosis is a mysterious malady, almost beyond our comprehension and understand that it is simply consumption caused by minute germs from a previous case of the disease finding lodgment in the system of animals where the conditions are favorable, grow and develop slowly or rapidly, according to circumstances, and produce the disease. This disease cannot be produced without the presence of the germ and probably not one tuberculous germ in ten thousand ever develops sufficiently to cause harm. They become dried and pass into the atmosphere and are

present nearly everywhere until destroyed by their enemies, among the most important of which are light and extreme heat. The condition of the system in which the germ finds lodgment and the environment with which it is surrounded are the important considerations in causing or preventing a case of tuberculosis. These are the important matters to be considered in restricting this disease.

The prevalence of bovine tuberculosis varies in different sections of the same country. It is generally found most prevalent in thickly settled sections and the greatest freedom where the animals are kept with the least confinement and forcing. Statistics regarding its prevalence are meagre. In 1890 and '91 over 12,000 animals were killed in England during the outbreak of pleuro-pneumonia under the direction of the board of agriculture and were subjected to a post-mortem examination, and it was found that over twelve per cent. of those animals that were killed on account of another disease were tuberculous. This is probably a higher per cent. than could be found anywhere in New Hampshire. Were it necessary to go through and make a complete examination with the tuberculin test the expense would be appalling, to say nothing of the effect upon the live stock industry. The advocates of the indiscriminate application of the tuberculin test and the destroying of all animals that react are growing less every day but it is now generally conceded that the test should be applied to herds where a physical examination reveals a case of the disease. Beyond this we leave without expressing an opinion, the extent to which this testing should be carried, to the wisdom of the legislature. The consideration of means of prevention is paramount to all else in the suppression of this widespread and alarming malady.

PREVENTION.

Our report is based upon observation and experience in the inspection of animals in over 500 barns in New Hampshire during the past two years. A careful consideration of this matter fails to reveal any single cause to which the devel-

opment of the germ can be traced, for the several causes contributing to it are generally associated where serious infection is found. Probably the most productive of any and that which is most often present, is the lack of proper ventilation in the stable. Good authorities claim that each full-grown animal should have 1,000 cubic feet of air-space with a change of air two or three times a day. This of course refers to a stable without ventilation. Within the last twenty years there has been excessive agitation of the necessity of keeping dairy animals warm as a means of increasing the milk supply and so earnestly was this advocated, without sufficiently enforcing the necessity of ventilation or without sufficient adoption by the stock owners, that old stables were boarded up in front and new stables were built with this end in view. Within the same period stimulating grain foods have come into the market and sold in some seasons at low prices in proportion to the nutriment they contain. In addition to this the thrifty dairyman has been told that each movement of a muscle by the cow reduced the secretion of milk and in many instances she was kept tied in the rigid stanchion from fall till spring, forced to her utmost capacity with stimulating foods and all the time kept in a close, ill-ventilated stable. The owner apparently secured his milk at less expense than under the former system, but the germs of tuberculosis, perhaps from an unknown source, found congenial soil in the system of those animals and it became a tuberculous herd. So slowly did the disease develop that its nature was unknown to the owner, much less its cause, and occasional drooping animals were innocently sold to a neighbor and aided in the contamination of his herd if conditions were anyway favorable. Sometimes they were sent to a distant town or state to pasture and, after a slight recuperation at pasture feed were disposed of to unsuspecting purchasers to carry the disease into new sections and into new herds. This in brief is the history of the development of the bovine tuberculosis existing in the country today and indicates the extreme importance of preventive measures which are largely in the

hands of the stock owner to enforce or neglect. We shall place at the head of the list of causes contributing to the development of bovine tuberculosis, insufficient ventilation of stables.

We find a wide difference of opinion among farmers and dairymen in regard to what constitutes proper and effective ventilation. An opening near the top of a close stable or tie-up will allow the heated air to pass out because it is lighter and tends to rise but the foul gases are heavier than pure air and settle towards the floor. A system of ventilation should take the air from the most contaminated part of the stable and carry it to the outside. A ventilating flue should be provided for this purpose and the draft will accomplish the object. We are referring now to those stables that are closed in tight in the form of box stables and commonly called boarded up in front. In addition to this the partition in front of the animals should be so arranged as to be left partially open, except in extremely cold weather and then should be closed with good judgment. A stable arranged in this manner with a ventilator in the roof of sufficient size to carry off the heated air can be used with safety, if proper attention is given to regulating it. We are not in favor of heating the air in the cow stable from the warmth of the animals to such an extent as is frequently practiced. We have entered many stables where it was extremely oppressive to remain any length of time on account of the excessive warmth and foul gases and those are the stables that contribute largely to the development of tuberculosis.

Another accessory cause of vital consequence and one which has been frequently discussed and has led to the most extravagant and unreasonable statements, is that of feed. It has been claimed with much earnestness that ensilage, cotton-seed meal, and other concentrated feeds that have come into general use within the present generation are direct causes of this disease. This claim has been made by men of high authority in matters of public concern, but fails to be verified

by any reliable data. We have given careful investigation to this matter and fail to find any connection between any kind of wholesome feed and the development of tuberculosis. The amount that is fed has something to do in causing it. Since the highly concentrated feeds have come into use, there has been a tendency to crowd the animals to their utmost limit at the expense of constitutional vigor. This has been justified in the mind of the feeder from the fact that it requires a certain amount of food to sustain the animal system and in the case of well bred animals, the larger amount they were able to digest and assimilate the more the profit derived from the feeding. This is without taking into account the effect upon the animal. The result has been that the system was overtaxed by the excessive strain put upon it and could offer less resistance to the tuberculous germs and fell a prey to the disease. A dairy animal may be forced by excessive feeding of stimulating food to such an extent that while the food itself causes no disease it so weakens the system that it has not the power to withstand the germ and we have a case of tuberculosis.

The breeding has something to do in this matter, for as in the case of feed, it tends to a condition favorable or antagonistic to the growth and development of the germ. The theory was long ago exploded that consumption is hereditary and the theory has become equally well established that the tendency to develop or to overcome the tuberculous germ is transmitted in blood lines. This is nothing more or less than a delicate constitution in the one instance and a rugged constitution in the other, and the same principle applies both to the human and the bovine race. The one may fall an easy victim to tuberculosis upon the most trivial exposure while the other may feed upon tubercle bacilli and never suffer harm. In the animal kingdom we find those breeds of cattle that have been developed in their dairy products rather than in physical qualities to be more susceptible to the germ than those developed in the beef type. Animals in which the natural constitution of the breed has been sacrificed by in-

and-in breeding, too young breeding or faulty breeding should never be allowed in the dairy herd for the most vigorous animals in the dairy breeds are none too rugged to withstand the attacks of this destructive germ.

One of the most potent agents in the destruction of the germ is sunlight and more of this health-giving agency should be invited into cattle stables. It costs little and has other healthy effects in addition to its power over the tubercle bacillus. The cattle stables should be arranged on the sunny side of the stable and should be well provided with windows. We have noted on various occasions the effect of dark, damp stables and have almost invariably found the disease in such places. We have also noticed the absence of the disease under the opposite conditions. We have in mind an instance where a tuberculous animal quite advanced with the disease was kept in a herd of 25 cattle for two years after the disease was noticed and upon applying the tuberculin test to the entire herd this badly diseased cow was the only one that responded. The reason that none others had contracted the disease was the fact that the sanitary conditions of the stable were first class and a spot as large as a person's hand could not be found in the entire stable where the sun's rays did not penetrate. Open up the dark, damp, dingy stables and let in Heaven's pure sun light and there will be less tuberculosis.

Exercise is an important matter in the prevention of this disease. Both too little and too much exercise will impair the powers of resistance, but the former is by far the most common. It is related to the other causes we have mentioned in this intense system of forcing and has been practiced for the purpose of getting the last quart of milk possible. Cattle that stand in the stable from fall till spring have no exercise to expand the lungs, the common seat of the disease, and germs that might otherwise be destroyed gain a foot-hold on account of this inactivity. A vigorous walk of several rods at least once a day to the water supply will be healthful and a prominent and important preventive. Too much exercise sometimes happens in the case of working oxen subjected to exces-

sive and continuous exposure without adequate care. This will cause a condition in which the germ will find a congenial soil. A horse may be driven excessively and become so exhausted as to contract a cold that ends in his death, when at another time the same horse under exactly similar conditions, except exhaustion, would pass through the same experience without any serious results. The same principle holds true in cattle and excessive strain upon muscular force opens the way for tuberculosis. We believe those entrusted with the enforcement and execution of laws for the suppression of bovine tuberculosis can have no iron clad regulations that will apply to every herd. Where the physical inspection reveals a case of tuberculosis and the conditions are such as to suggest the absence of sanitary precaution for a period of time, the application of the tuberculin test is advisable, but there seems to be a serious and unnecessary waste in killing and burying every animal that reacts to the test, however slightly it may be affected. In the comparative freedom of the herds of New Hampshire from the disease in a serious form, we believe a campaign of education along sanitary lines will accomplish more than a universal use of the tuberculin test. There are hundreds of cattle slightly affected with the germs of the disease that will never develop sufficiently to cause harm to man or animals, if proper sanitary measures are observed. The importance attached to these preventive measures has led the Board to issue circulars of information upon the subject and to have the matter discussed in farmers' meetings and institutes in various sections of the state, believing a campaign of education for the dissemination of knowledge in regard to preventive measures to be the most important phase of the subject. The permanent suppression of the disease largely depends upon the adoption of proper sanitary measures, among the most important of which are ventilation, sunlight, judicious feeding, careful breeding and a reasonable amount of exercise.

QUARANTINE.

Since 1892 quarantine regulations have existed against bringing cattle into New Hampshire from Massachusetts, except upon a certificate of soundness by a qualified veterinarian based upon a physical examination. At various times since the above named date, other New England states have established quarantine regulations against all outside territory admitting animals only on the result of the tuberculin test. The enforcement of these regulations resulted in the introduction into New Hampshire of diseased animals that were debarred from other states.

For protection of the stock interests of New Hampshire and the health of the people the following order was issued, July 14, 1896:

STATE OF NEW HAMPSHIRE.

BOARD OF CATTLE COMMISSIONERS,
CONCORD, July 14, 1896.

General Order No. 3.

1st. General Order dated January 11, 1892, and General Order dated January 19, 1892, are hereby repealed.

2nd. All persons and companies are hereby prohibited from bringing or driving neat cattle into the State of New Hampshire without a permit from this Board.

3rd. All neat cattle brought or driven into the State of New Hampshire under a permit from this Board, are hereby placed in quarantine upon arrival in the state until identified and released.

4th. Selectmen of towns and cities of New Hampshire are hereby authorized to seize and hold in quarantine any neat cattle coming into the state without a legal permit, and notify this Board at once of such action.

5th. Permits to bring or drive neat cattle into New Hampshire will be issued only upon the result of the tuberculin test

to be applied and reported under such regulations and forms as will be furnished upon application to this Board.

6th. This order is issued under authority of Chapter 113 of the Public Statutes of New Hampshire, and all violations will be vigorously prosecuted.

7th. This order shall take effect on the fifteenth day of July, 1896.

IRVING A. WATSON, *President*,
N. J. BACHELDER, *Secretary*,
Board of Cattle Commissioners.

On the same date the following letter of information was issued:

STATE OF NEW HAMPSHIRE.

BOARD OF CATTLE COMMISSIONERS,
CONCORD, July 14, 1896.

To whom it may Concern:

The quarantine regulations issued by the Board of Cattle Commissioners of the State of New Hampshire against all cattle outside of the state are made necessary by the action already taken in the same line by the authorities of other New England states. Evidence has been submitted to this Board that animals, failing to pass the test and therefore debarred from those states, are being brought into New Hampshire and are contributing to our milk supply to the injury of the healthfulness and reputation of New Hampshire dairy products.

Persons desiring to bring cattle into New Hampshire will be furnished upon application with the necessary blanks upon which to forward the result of the test, said test to be made by any person who is satisfactory to the Cattle Commissioners of the state in which the test is made. Upon arrival in this state the cattle will be identified and released as soon as practicable by this Board or its representative.

In making the report of the tuberculin test, when applying for a permit, both the original and duplicate reports are to

be made out and forwarded to this office without being detached from the blank permit.

BOARD OF CATTLE COMMISSIONERS,
Concord, N. H.

Under this regulation cattle have been admitted upon filing evidence of soundness as indicated by the tuberculin test. This regulation should be sustained as long as similar regulations are enforced by the adjoining states.

INSPECTION.

The Board has acted upon the principle that in order to carry out the intention of the law it was necessary to have the authority to adopt such measures as the circumstances required in cases where inspection was made. Every request made to the Board for inspection has been responded to by the following letter and blank application.

THE STATE OF NEW HAMPSHIRE.

BOARD OF CATTLE COMMISSIONERS,
CONCORD, ..., 189 .

Dear Sir:

The Board is now prepared to continue the inspection of animals for tuberculosis and the work will be pushed as rapidly as possible in the order in which applications are received. After due consideration the Board is convinced that it must have the authority of the owner of suspected herds to make as thorough inspection as possible and, if the conditions require it, have authority to apply the tuberculin test. This Board fails to discover reliable evidence of injury to healthy animals from the application of this test, and when applied by skillful men is practically reliable.

If you will fill and return the enclosed blank in regard to your herd, which has been reported to us as suspicious, we will make the examination as early as possible, considering the applications in the order in which they are received.

Yours truly,
N. J. BACHELDER, *Secretary.*

APPLICATION FOR CATTLE INSPECTION.

....189....

To the Board of Cattle Commissioners,
State of New Hampshire,
Concord.

GENTLEMEN: I hereby make application for an official inspection of my herd of cattle, in regard to which I make the following statement:

My entire herd consists of..... .....cattle.

First noticed symptoms of disease about.....

Symptoms noticed are.....

These cattle are at my stable located about.....miles from .....the nearest railroad station.

If the board considers an investigation advisable and upon a physical examination finds sufficient symptoms of tuberculosis in the herd, to warrant, in the opinion of the board, the application of the tuberculin test to the herd, I hereby authorize its application by the board. I understand the expense of making the inspection to be entirely borne by the board and that, according to law, I am to receive one-half the health value of all animals condemned by the test and destroyed in the presence of myself, or that of my agent. I also agree to disinfect the stable and take other precautionary measures in accordance with the instructions of the cattle commissioners.

(Signed)

....

P. O. Address.....

Upon receipt of the application properly filled out and signed inspection was ordered if the symptoms reported indicated to a reasonable degree the presence of tuberculosis. While no iron clad rules in regard to the frequency of inspections in any given locality have ever been enforced, it has not

generally been the practice to incur the expense of inspections oftener than once a month in any town. In some instances longer delays than this have occurred, but the Board has been guided by business judgment with due regard to the danger from the disease. The result of the inspection has been as follows:

County.	Herds Inspected.	Animals Destroyed.
Belknap	14	6
Carroll	8	10
Cheshire	33	38
Coos	9	8
Grafton	22	39
Hillsborough	284	333
Merrimack	82	78
Rockingham	57	31
Strafford	7	19
Sullivan	1	
	517	562

The post mortem examination made on each of the 562 condemned animals destroyed verified the diagnosis in 559 cases leaving only three in which the disease was not found. As no microscopic test was made in either instance it probably existed in these three animals.

Explicit directions have been given in each instance for the disinfection of the premises and the measures advisable to adopt for the prevention of reappearance of the disease. All ill-ventilated and poorly lighted stables have been ordered changed in accordance with the most progressive ideas upon the subject.

Eight cases of glanders have been destroyed and attention given to all reports of contagious diseases that came under the jurisdiction of the Board.

FINANCIAL.

The statute provides for the payment of one half the health value for diseased cattle destroyed. In the case of badly diseased animals this is an excessive amount and in the case of slightly diseased animals, it is insufficient. Inasmuch as

herds are tested only on the request of the owner and then only when the Commissioners deem the application of the test to be warranted by the conditions, the provisions of the statutes in regard to the basis of payment for animals destroyed seems on the whole to be just and equitable. The object of the law is not the reimbursement of owners of animals for the misfortune of having the disease in the herd, but to provide for reimbursing the owner for the actual loss sustained in having diseased animals taken from the herd and destroyed for the protection of healthy animals and can only be construed to mean their value in a diseased condition. We believe this object to be accomplished in the provisions of the law when the average conditions are taken into account. Following is the financial statement for 1895 and 1896:

1895.

211 condemned cattle destroyed (one half health value)	$ 3,654.50
4 condemned horses destroyed (diseased value)	16.00
Services of veterinarians	979.00
Expenses of veterinarians	305.83
Burying cattle destroyed	211.00
Disinfectants, tuberculin, instruments, travelling expenses and incidentals	262.78
Clerk hire	500.00
Total	$ 5,929.11

1896.

351 condemned cattle destroyed (one half health value)	$ 6,705.00
4 condemned horses destroyed (diseased value)	16.00
Services of veterinarians	1,722.50
Expenses of veterinarians	382.29
Burying cattle destroyed	351.00
Disinfectants, tuberculin, instruments, legal advice, travelling expenses and incidentals	317.01
Clerk hire	500.00
Total	$9,993.80

CONCLUSION.

In closing this report the commissioners repeat the statement with emphasis that the permanent suppression of bovine tuberculosis depends in a great degree upon the action taken by the stock-owners in adopting proper sanitary measures. We believe no method of procedure to secure this is more practical, economical or effectual than the method pursued in New Hampshire. The advocacy of preventive measures, the physical examination of suspected animals, the application of the tuberculin tests, if circumstances warrant, and careful instruction in each instance where disease is found in the disinfection of the stable and in such changes of structure as are necessary, will not fail to accomplish good results. It is along these lines that diseased herds may be changed to healthy herds and assistance rendered the stock owner in the most practical and economical manner. The disease can never be exterminated, but the danger from it may be reduced by the adoption of such measures as are advocated in this report.

Respectfully submitted,

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N. J. BACHELDER, *Secretary.*

THE COMPOSITION AND INFECTIOUSNESS OF MILK.[1]

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When I determined, upon the invitation of your secretary, to present a paper at this meeting of the Association, I concluded that I would submit to you some observations upon "Animal Food", in general. However, as I began to investigate the subject, a field so wide, extensive, and inviting, opened up that I feared to enter, lest in roaming through its highways and by-ways, and reveling in its attractions and incidents, I should become prodigal of your time, and weary you with much speaking. Hence, I have selected as the subject of my paper, "The Composition and Infectiousness of Milk," believing that this one item of animal food will afford an opportunity to present, within reasonable time, some facts which, though not new to most of you, are worthy of being twice told. Indeed, the subject is of so much importance, and enters so much into our daily life, and is so universal in its application that it cannot be too often, or too prominently, brought before the public.

For the purposes of this article, cows' milk alone will be considered, since no other kind of milk is used by many infants and adults; and since it is the almost universal and, under proper conditions, the best substitute for human milk in the feeding of children.

Cows' milk, according to Cameron, is composed of the following parts per 1,000,000:

[1] Presented at the Buffalo Meeting of the Association, September 15–18, 1896.

Water		870,000
Fat	40,000	
Casein	41,000	
Sugar	42,800	
Salts	6,200	
Solids (not fat)	90,000	130,000
		1,000,000

It also contains gases in solution in the following proportions, in 30 parts per 1,000, in volume:

Oxygen	1.29
Nitrogen	12.17
Carbonic acid	16.54

It will thus be seen that pure, uncontaminated cows' milk contains, in practically proper proportions, all the elements of a perfect food. Human milk, its closest analogue, is the only food prepared by nature for the most critical period of human life; and for nine to ten months all the marvelous developments of infancy are best promoted by the sole use of breast milk.

In adults, milk alone will sustain life longer than any known food. Drs. Coplin and Bevan, in their excellent "Manual of Practical Hygiene," say: "The writers are aware of a patient who lived three years upon three to five pints of milk daily, and a patient in the hospital of the Jefferson Medical College, suffering from carcinoma of the gullet, received three pints of milk daily, and gained considerable weight and strength during the period of thirteen months."

The quantity of milk used in the United States annually, either in its original form or its products, butter and cheese, is enormous, and attests its importance as an article of food. Especially is it important because of the large number of infants who are artificially fed, and whose sole dependence for life itself is upon milk.

It is said that during the year 1895, in England and Wales, one fifth of the total deaths were children under one year old, and it has been shown that of this frightful mortality much the

greater proportion were artificially fed children. In Berlin, in giving the certificates of death of children under one year, the fact must be stated as to whether the child was fed from the breast or brought up artificially. In ten thousand deaths thus reported it was found that two thirds, or 7,646, were artificially fed.

Hope, in a series of investigations in England, discovered that only 3 per cent. of one thousand deaths occurred in infants that were breast fed; and Minert of Bavaria found in a similar investigation that, out of four hundred deaths of children from summer diarrhoea that came under his notice, 96 per cent. were fed artificially.

In view of these facts it is pertinent, therefore, to inquire whence come some direful results from the use of an article of food so well adapted by nature, in its normal condition, to the growth and development of the body?

The cause of quite a large number of deaths of these children artificially fed is inanition, the milk having been largely deprived of its nutritious properties by the addition of water, in many places commercial milk being diluted from 25 to 30 per cent.

This dilution is not only a fraud upon the buyer, but a great crime perpetrated upon the innocent child, who needs the milk, with its rich per cent. of butter-fat, as secreted by the udder, in order that it may grow and develop. If deprived of this essential element, instead of thus growing, the muscles become flaccid, the features haggard and pale, and, finally, literal starvation occurs.

Many states now have dairy laws which are intended to protect the people against this fraud of adulteration, and in some places the law is measurably successful. Even where there is a rigid and apparently efficient inspection of milk, however, and the butter-fat is up to the per cent. prescribed, the inspection is not expected to reach further. The commercial rather than the sanitary interests of the consumer are guarded.

The design of this paper is to emphasize and intensify the

importance of a sanitary inspection in addition to, if not to the exclusion of, the mere commercial examination. Indeed, a faithful sanitary inspection must of necessity exclude all adulterants, whether for the purpose of increasing the bulk or changing the quality of the milk.

But little effort has yet been made to determine the condition of the cattle giving the milk, whether healthy and free from any infectious disease; to examine the feed and water given the cows; the sanitary condition of the stables; the character of the water used for washing the cans, if not for diluting the milk; the sanitary condition of the milkman's family, and whether they have any infectious diseases; and the habits of those handling the milk, and the methods used in milking. All these are important conditions, which contribute greatly to the healthfulness or infectiousness of the milk.

The first thing of importance is to determine whether the animal furnishing the milk is healthy or not. If a corrupt fountain cannot send forth pure water, neither can a diseased cow secrete and furnish pure and wholesome milk.

An interesting report prepared by S. C. Busey, M. D., and G. M. Kober, M. D., of Washington, D. C., has recently been published by the health officer of the District of Columbia, for 1895, on "Morbific and Infectious Milk." The authors point out certain diseases of cows that affect the milk deleteriously, if not dangerously. Among those diseases which render the milk unfit for food, they cite the following affections: Garget, and inflammatory condition of the udder and teats; gastro-enteric diseases; acute specific enteritis; puerperal and other septic fevers; foot and mouth disease; cowpox; anthrax; pleuro-pneumonia; rabies; tetanus; and tuberculosis.

They proceed in their report to furnish ample proof of the infectious character of milk from cows affected with the foregoing diseases, and show that often loathsome and fatal sickness has arisen because of the use of milk thus affected.

It is said that about one seventh of all the deaths occurring in the world are from tuberculosis, and as it has been universally conceded that tuberculosis in man and cattle is identical,

it is important to know to what extent this disease prevails among cattle. It is fair to assume that it is much more frequent than is believed. Avarice and commercial greed combine to secrete and minify the prevalence of the disease, and to weaken or prevent belief in the infectiousness of the milk and meat of such animals.

Despite this disposition to conceal the extent to which this disease prevails, veterinarians and commissions are diligently and successfully turning on the search-light of investigation, and already some interesting facts have been discovered.

Fleming says: "Tubercular phthisis, or tuberculosis, probably prevails among domesticated animals over the entire globe, though its frequency will depend upon various external influences, as well as the constitutional tendencies of different species and breeds. In some countries it is enzoötic and very destructive. In Mexico, for instance, it is very common and causes much loss, about 34 per cent. of the animals slaughtered for food being found affected.

In France, M. Arloing estimates that among the adult bovine animals five out of every one thousand are tuberculous. The proportion in England, according to Mr. Cope, is from 1 to 26 per cent., depending upon the locality. In Belgium the estimate is 4 per cent. In Holland the proportion given varies from 8.4 to 10.6 per thousand.

Dr. Winchester reported to the Massachusetts Cattle Commission that, during 1887 and 1888, he had learned of thirty-four head of cattle in which tuberculosis was actually demonstrated by post-mortem examinations. These herds contained 866 cattle. Of these, 243, or 28 per cent., were pronounced tuberculous, and upon being killed, were found to be diseased. In fifteen other herds there were 244 head. Twenty-eight of these showed marked symptoms of tuberculosis, and twenty-four more were suspected. Post-mortems, however, were not obtained. Thus in these forty-nine herds, consisting in all of 1,110 animals, 271 were reported as tuberculous and 213 as suspicious.

Later reports and more extensive examinations increase rather than diminish the per cent. of tuberculous animals.

Dr. Harold C. Ernst, in his report to the Massachusetts Society for the Promotion of Agriculture, published in 1895, in which he tabulates the replies given to a series of questions, gives the following summary:

In the practice of thiry-nine veterinarians, representing seventeen states, most of them reporting for one year only, there occurred 549 cases of tuberculosis, and 242 suspicious cases, a total of 749 among 165 herds, containing, in round numbers, 3,000 animals; that is, in the herds where tuberculosis existed, about 18 per cent. were diseased, and over 8 per cent. suspicious, a total of about 26 per cent.

It is proper to state here that, while tuberculosis is so prevalent and so widespread, the number of cattle affected with the other diseases named is comparatively small.

Having shown the extent to which tuberculosis exists, it is pertinent to inquire as to the danger of using milk from animals thus diseased. Nor is there an abundance of evidence wanting on this point.

Dr. Ernst, in obtaining data for his report above referred to, made an effort to obtain, so far as possible, clinical reports of cases of transmission of tuberculosis through milk from mother to offspring. In order to secure reports from the most reliable as well as most probable sources of information, he addressed a letter to eighteen hundred physicians and veterinarians, selecting the former from the membership of the Massachusetts Medical Society of at least five years' standing, from the American Surgical Association, from the American Medical Association, and from one or two other special societies of the country. The names of the latter were taken from the rolls of the United States Veterinary Association, and included those who were thought to have had enough experience to make their observations of possible value in this direction.

The direct question asked was: "Have you ever seen a case of tuberculosis which it seemed possible to you to trace to a milk supply as a cause?"

After receiving replies from the majority of those thus interrogated, he concludes his report as to the infectiousness of milk as follows:

"1. While the transmission of tuberculosis by milk is probably not the most important means by which the disease is propagated, it is something to be guarded against most carefully.

"2. The possibility of milk from tuberculous udders containing the infectious element is undeniable.

"3. With the evidence here presented, it is equally undeniable that milk from diseased cows, with no appreciable lesion of the udder, may, and not infrequently does, contain the bacillus of the disease.

"4. Therefore, all such milk should be condemned for food."

It is a well-settled fact that milk in the udder of a healthy cow is normal and free from all micro-organisms, and that it is only after leaving the udder that these organisms make their appearance.

It has been an interesting question and the occasion of careful and painstaking observation and experimentation as to whether the milk, as it comes from the udder of a tuberculous or otherwise diseased cow, is so affected by her diseased condition as to produce the same or a similar disease in other animals (including the human) by using it; or whether the contraction of tuberculosis following the use of such milk is the result of the introduction of the tubercle bacillus during and after the process of milking.

The opportunities to determine this point must be rather few. As soon as the milk leaves the teat it is liable to infection in numerous ways, and even the calf receiving the milk directly into its mouth from the udder may get the infection from the external surface of the teat by germ-laden dust, or other adherent particles. Experiments that have been made in which all known or possible sources of infection were eliminated seem to prove conclusively that the milk of a tuberculous cow, even before it leaves the udder, as well as the meat of the animal, is infectious in character, unsafe, and unfit for food. This applies to cows in which there is no appreciable lesion of the udder, and is a refutation of the opinion so generally prevail-

ing that only cows having tuberculous udders are capable of reproducing the bacillus in the milk.

At the Iowa Agricultural College experiment station, as a result of observations and experiments by Drs. Stalker and Niles, it was found that calves from healthy mothers that were at birth put with tuberculous animals to be raised, in a few months developed tuberculosis, while calves dropped from tuberculous animals and brought up by healthy cows showed no signs of the disease at all, grew well, were sleek, took on fat, and when killed later, showed none of the characteristic lesions of tuberculosis; thus showing that, so far as these experiments indicated, tuberculosis was not hereditary, and that the milk from tuberculous cows produced the disease in calves born of healthy animals.

Prof. James Law, in his very able paper on "Tuberculosis in Relation to Animal Industry and Public Health," dwells upon this point at considerable length. Coming from a source so eminent, his conclusions are entitled to, and have received, generous consideration and implicit confidence.

After considering the danger of the transmission of tuberculosis by the blood and meat of tuberculous animals, he proceeds to the consideration of the "danger from milk," and says:

"Milk is more to be dreaded than meat, because the udder is often the seat of tuberculosis, and the milk is usually taken uncooked. The danger is enhanced by the fact that this is often the necessary and only food of the infant and the invalid, in which the germ is especially liable, through weak and imperfect digestion, to escape into the susceptible bowel.

"In milk, as in the case of meat, a strong and vigorous digestion does, in some measure, protect the consumer. Peuch fed a two-months old pig in five days four and one half quarts of milk drawn from a tuberculous udder, and, killed in fifty-six days, it proved quite sound. He inoculated four rabbits with the milk and all four became tuberculous. Again, in the absence of tuberculosis in the udder the milk may be little, if at all, infecting. Gerlach, who produced tuberculosis in

calves, pigs, and rabbits by feeding the milk, found no results from certain tuberculous cows, while others infected a large proportion. Nocard and McFadyean have been unable to infect rabbits, etc., with milk from an apparently sound udder of a tuberculous cow. The same has been my experience with milk from one cow in the last stages of chronic tuberculosis, and another having acute tuberculosis. Bollinger, Nocard, and McFadyean claim that in the absence of tubercle in the udder the milk is not infecting. Whether true or not, as an ultimate fact this cannot be made a rule of action, as the following will show:

"Hirschberger inoculated rabbits in the abdominal cavity with the milk of twenty-nine tuberculous cows, of which the udders were, or appeared, sound, and produced tuberculosis fourteen times.

"Bang inoculated from sixty-three cows selected for their sound udders, and found the milk of nine of them infecting. A careful microscopic examination revealed tuberculosis in the udders of three of the cows leaving six giving infecting milk in which even after death, and with all scientific appliances, no tubercle could be found in the udder. This is nine and one-tenth per cent., as tested by the microscope after death; it was fourteen and twenty-eight hundredths per cent., as tested by the able veterinary professor during the life of the cows.

"Ernst found ten cows in thirty-five with infecting milk, though the udders were sound. In one hundred and three animals inoculated, seventeen contracted tuberculosis, and of twelve calves sucking the cows, five became tuberculous.

"Drs. Smith and Kilborne (Bureau of Animal Industry, Balletin No. 3,) found the milk infecting in three cows out of six with apparently sound udder. One infecting cow, and one non-infecting one, had each tubercle in the lymphatic gland behind the udder. Forty-four per cent. of the inoculated guinea pigs contracted tuberculosis; one in five from one cow, eight in ten from another, and six in six from a third.

"In my own experience, three calves from healthy parents

sucking the apparently sound udders of three cows with general tuberculosis, all contracted the disease.

"It must be allowed that calves sucking the cows run extra risk of infection through their nurses licking them, and through feeding from a common trough, but there is the same danger for the ordinary milk consumer, since the cow in licking her udder, is liable to leave bacilli to fall into the pail at the next milking.

"Again, the concentration of the bacillus in the undiluted milk of an infecting cow, rendered this much more dangerous than the milk of the same cow diluted with that of twenty, fifty, or one hundred cows.

"Bollinger and Gebhardt found that milk which infected all animals which took it pure, was apparently harmless when diluted with fifty or one hundred times its volume of the milk of sound cows. As the bacillus can live in milk, this apparent loss of virulence must be largely due to the reduction of the number of bacilli in a given measure of milk, and to their tendency to removal by adhering to the sides of the vessel during the mixing.

"Tuberculous expectoration, which is incomparably richer in bacilli, may be diluted in one thousand times its volume of water, and yet remain infecting. But again, the glutinous saliva forms a protecting coating which strongly resists dilution.

"Instances of accidental tuberculosis of the human being through drinking the unsterilized milk are no longer wanting.

"In the practice of Dr. Amorback, a well-developed five-year-old boy from sound parents, whose ancestors on both male and female sides were free from hereditary taint, succumbed after a few weeks' illness with acute milliary tuberculosis of the lungs and enormously enlarged mesenteric glands. A short time before, the parents had their family cow killed, and found her the victim of advanced pulmonary tuberculosis. (Lydtin.)

"Dr. Demme records the case of four infants in the Child's Hospital, at Berne, the issue of sound parents, without any

tuberculous ancestry, that died of intestinal and mesenteric tuberculosis, as the result of feeding on the unsterilized milk of tuberculous cows. These were the only cases in which he was able to exclude the possibility of other causes for the disease, but in these he was satisfied that the milk alone was to blame.

"After a lecture of the author's at Providence, R. I., a gentleman of North Hadley, Mass., a graduate of the Massachusetts Agricultural college, publicly stated that his only child, a strong, vigorous boy of one and one-half years, went to an uncle's for one week and drank the milk of a cow which was shortly after condemned and killed in a state of generalized tuberculosis. In six weeks the child was noticeably falling off, and in three months he died, a mere skeleton, with tuberculosis of the abdomen. The father could trace no tuberculosis among his near ancestors, but the mother's father and uncle had both died of it. She remains in excellent health.

"Dr. E. O. Shakespeare (Med. News, March 26, 1892) attributes one fifth of all deaths of infants and young children feeding on milk to tuberculosis, usually commencing in some part of the digestive organs."

In June, 1896, Drs. Sidney Martin and Gins Woodhead, and Professor McFadyean, of the Royal Commission of England, who were appointed to make special inquiries as to the effect of food derived from tuberculous animals, made their report. The report of Dr. Martin, who is exceedingly conservative, is of special value, because of the positive results he obtained with regard to the infectivity of milk from tuberculous cows. He says: "The milk from cows with tuberculosis of the udder posseses a virulence which can only be described as extraordinary."

He recommends as a practical measure, that the milk from all cows in which one or more quarters of the udder are enlarged, or modulated, or in which the milk from one or more quarters fails either in quality or quantity, should be at once excluded, and the cows examined by an expert. He further declares that every tuberculous cow must be looked upon with

suspicion, for, although the presence of tuberculosis of the internal organs, in his opinion, does not confer infectivity on the milk, yet tuberculosis may develop in the udder at any stage of the general disease.

Dr. Woodhead, by his experiments and observations, arrives at the conclusion that in children, at least, general tuberculosis infection is, in many, very many cases to be traced to the ingestion of infected milk—that is, it is not necessary that a local lesion of the alimentary canal should be produced. The tubercle bacillus may run the gauntlet of the lymphoid tissue of the intestines and pharynx, to establish itself in the mesenteric, or the cervical, and finally the trachio-bronchial glands, from which, by a process of extension, or secondary infection, tuberculosis of the peritoneum, the lungs, or a generalized tuberculosis may ensue.

Prof. M. Stalker, of the veterinary department of Iowa Agricultural College, who has been making extensive investigations of this subject, reports two cases which came under his observation. One case was where five young people between the ages of twenty and thirty years died of consumption in one family during a period of two years. No trace of the disease had ever been known in the family of either the father or mother of the victims. On the farm where the deaths occurred, he found seventeen cases of tuberculosis in the herd of cattle, and others had died before the investigation was made.

Another case was in connection with a diseased herd of cows that was under test. A mother and child died; the mother from undoubted consumption; the child from intestinal trouble highly suggestive of the same disease. The cow that had supplied milk to the mother and child was tested and found to be tuberculous. Post-mortem examination of the cow revealed a badly tuberculous condition of the udder.

Enough has already been said to convince the most skeptical that there is great danger of infection from the use of milk from diseased animals, especially from tuberculosis.

Unfortunately, the only infected and dangerous milk is not

from tuberculous cows. It is well known that the best milk—milk from cows in which there is not a taint of disease, after leaving the cow becomes infected. It will be readily conceded that the most of the cases of disease arising from the use of infected milk occur where the milk has been from healthy cows, and into which the pathogenic germs were introduced after leaving the cow. The extensive epidemics of infectious diseases produced by the use of infected milk arise in this manner.

Drs. Busey and Kober, above referred to, in noticing some instances of milk that had acquired infective properties only after it had left the udder of the cow, say:

"Numerous instances have been observed in which outbreaks of typhoid fever, scarlet fever, and diphtheria, by their sudden and explosive character, affecting families living in streets or localities visited by the same milkman, naturally pointed to the milk supply as a common cause; but to Dr. Michael Taylor belongs the honor of being the first to point out definitely that cows' milk might serve as a medium of spreading typhoid fever from a dairy where the disease prevailed. In 1867, Dr. Taylor also showed that scarlet fever might be distributed in the same way. In 1877, Mr. Jacob traced a diphtheria epidemic at Sutton to milk supply, and in 1872, Macnamera traced an epidemic of cholera at Calcutta to an infected dairy."

These facts could not fail to invite criticism and sharpen the power of observation in others, and in consequence similar outbreaks were more frequently reported, so that Mr. Ernst Hart, in a valuable paper, was enabled to present to the International Medical Congress held in London, 1881, the history of fifty outbreaks of typhoid fever, fifteen of scarlet fever, and seven of diphtheria, all traceable to the milk supply; but even this formidable display of facts was not accepted as conclusive, largely because the milk industry constitutes a strong spoke in the commercial wheel, and naturally opposed what they considered meddlesome interference with their trade, and in many instances were upheld by members of our profession who considered the evidence wholly circumstantial and in-

complete, as long as the specific germ of the respective diseases had not been demonstrated in the suspected milk. * * * An approach in this direction worthy of emulation has been made by Prof. Vaughan before the Congress of Demography, in London, August, 1891, when he declared:

"Milk has been frequently diluted with water containing germs of typhoid fever, and the prevalence of the disease may mark the daily rounds of the milkman. I have here a culture tube containing a bacillus which I found simultaneously in the water from the dairy well, and in the milk from the cans. At the same time one or more cases of typhoid fever existed in every family which patronized this milkman. The bacillus resembles, but is not identical with, that of Eberth."

They further, in their report of epidemics of typhoid fever, scarlet fever, and diphtheria, say:

"Mr. E. Hart tabulated fifty epidemics of typhoid fever, and we have collected eighty-eight, making a total of one hundred and thirty-eight epidemics traceable to a specific pollution of the milk, the main facts of which are presented in a subjoined table. In one hundred and nine instances there is evidence of the disease having prevailed at a farm or dairy. In fifty-four epidemics the poison reached the milk by soakage of the germs into the well water with which the utensils were washed, and in fourteen of these instances the intentional dilution with polluted water is admitted. In six instances the infection is attributed to the cows drinking or wading in sewage-polluted water. In three instances the infection was spread in ice cream prepared in infectious premises. In twenty-one instances the dairy employés also acted as nurses. In six instances the patients while suffering from a mild attack of enteric fever, or during the first week or ten days of their illness, continued at work, and those of us who are familiar with the personal habits of the average dairy boy will have no difficulty in surmising the manner of direct digital infection. In one instance the milk tins were washed with the same dishcloth used among fever patients. In this instance the disease was attributed to an abcess of the udder (?), in another to teat eruption (?), and in still another to a febrile disorder (?) in the

cows. In four instances the disease was spread through the medium of creameries, and in one instance the milk had been kept in the sick-room.

"Mr. Hart collected statistics of fifteen epidemics of milk scarlet fever, and we have tabulated fifty-nine, making a total of seventy-four epidemics spread through the medium of milk supply (?).

"In forty-one instances the disease prevailed either at the milk farm or dairy. In six instances persons connected with the dairy either lodged in or had visited infected houses. In another instance the milkman had taken his can into an infected house. In twenty instances the infection was attributed to disease among the milch cows; in four of these the puerperal condition of the animal is blamed. In nine instances disease of the udder or teats was found. In one instance the veterinarian diagnosed a case of bovine tuberculosis. In six instances there was a loss of hair and casting of the skin on the animals. In another instance the cattle were found to be suffering more or less from febrile disturbance. In ten instances the infection was conveyed to persons connected with the milk business while suffering or recovering from an attack of the disease, and in at least eight cases by persons who acted as nurses. In three instances the milk had been kept in the cottage close to the sick-room. In another instance the cows were milked into an open tin can, which was carried across an open yard past an infected house; and in another instance, the milkman had wiped his cans with white flannel cloths (presumably infected) which had been left in his barn by a peddler. Two epidemics appear to have been instances of mixed infection of scarlet fever and diphtheria.

He also collected statistics of seven epidemics of milk diphtheria, and we have added twenty-one more. In ten of these twenty-eight instances, diphtheria existed at the farm or dairy, and in ten instances the disease is attributed directly to the cows having garget, chapped and ulcerative affections of the teats and udder, while in one instance the cows were apparently healthy, but the calves had diarrhoea. In another instance one

of the dairy-maids suffered from a sore-throat of an erysipelatous character; in another, the patient continued to milk while suffering from diphtheria; and in still another, one of the drivers of the dairy wagons was suffering from a sore throat.

"It is interesting to note that of one hundred and thirty-eight epidemics of milk typhoid, seventy-four of scarlet fever, and twenty-eight of diphtheria, a total of two hundred and forty epidemics, one hundred and eighty-seven have been recorded by English authors, thirty-one by American, and nine by Scandinavian; eight came from Germany, three from Australia, and one each from French and Swiss sources.

"Whether this is due to the fact that on the continent of Europe milk is rarely used in a raw state, or whether it is simply an index of the greater interest taken in England and the United States in preventive medicine, remains to be determined."

Three or four instances of epidemics of typhoid fever occurring in this country from the use of infected milk will be given somewhat in detail, in order, not only to demonstrate that such outbreaks do occur, but to also illustrate the necessity for, and the success attainable by, intelligent and faithful investigation.

In June, 1890, the Connecticut State Board of Health was requested to investigate an outbreak of typhoid fever at Waterbury. Attention was first directed to the water supply and drainage, which were found not to be the cause. There were thirty-five house invasions with fifty cases. Of these, twenty-six houses, with forty-one cases, it was discovered, were supplied with milk from the same milkman; that this milkman secured his milk from several farms; that the invasion followed the route of milk from a certain one of these farms. An investigation was made at this farm, and it was found that the farmer, his daughter, and a farm hand had been sick with typhoid fever. The excreta of the sick were thrown upon the barn-yard; the hired man defecated, so long as able to be about, in the cow stables. The barn-yard was in a bad condition. The milk was handled in a shed attached to the barn. In fair weather the milk cans were washed outside the shed; on rainy

days inside the shed. A door opened from the shed into the cow stables on one side, and another door into the barn-yard. In the yard was a tank in which the milk cans were placed to cool. The can lids were tilted so as to admit the air. There could be no question as to the source of the infection of the milk. The water used was from a spring, and free from the typhoid bacillus. The material of the barn-yard was infected, and the conditions were favorable for extensive multiplication. It was tracked into the milk room by the men, and there drying into dust, was carried by air currents into the milk.

Among the cases in this invasion, was one of a person who did not use the milk. But it was found that two weeks prior ice cream had been eaten, and that the milk came from the infected farm—thus confirming the work of Prudden, and others, that typhoid bacilli retain their vitality for months frozen in blocks of ice. The milk supply from this farm was stopped, and the disease subsided.

In August, 1892, an epidemic of typhoid fever appeared in a particular portion of the city of Springfield, Mass., a detailed account of which is given in the report of the State Board of Health. The people, as well as the physicians, were perplexed, and various theories were put forth as to the source of infection; for it was in the best part of the city, where the environments apparently precluded the usually accepted sources. First, the water of certain wells was suspected, but investigation showed that most of the infected families used only water from the city water-works, which was uncontaminated. The drainage was suspected, but it was shown that the houses were mostly new, and the plumbing was good. The sewer was suspected, but families living nearest the manholes of the sewers were unaffected. The cemetery was also suspected, but it was found that a well in the cemetery contained less ammonia than wells in the typhoid district, where the disease was most prevalent. The theory of ice infection was also tested and exploded. It was finally discovered that all the infected families were supplied with milk from one man; that in the most infected portion, one family was exempt entirely

from the disease, and this family received milk from another milkman. On investigation of the farm of the milkman, it was found that early in the spring the milkman's daughter was sick with so-called "bilious typhoid fever." Others of the family were also sick with a "slow fever." The excreta of the patients were thrown into a privy vault, and the contents of the vault were subsequently thrown upon a tobacco field. Near by was a well not used for drinking purposes. Into this well the milkman lowered his cans of milk, letting them sink to the bottom, to remain until they were taken away to supply his route. In the well was an old chain pump. Over the well were loose planks. The men, in wet weather, tramped over the tobacco field, through the cow yards, and then to the well. The planks over the well were filthy with mud, and careless pumping washed the mud and filth into it. The water was dirty, and was found to contain bacillus coli communis to an enormous extent. Nine milk cans were lifted from the well. They were stopped with wooden stoppers. On tipping the cans, milk ran out around the stoppers. This being true, the water of the well would run in. None of the cans were full. The facts, as developed in this investigation, left no room for doubt or question as to the source of the epidemic, wherein there were one hundred and fifty cases, with twenty-five deaths. Of the one hundred and fifty cases, one hundred and one had milk from the same man, and one hundred and thirty-five had access to the same milk.

In October, 1894, the secretary of the Board of Health of Titusville, Pa., found three cases of typhoid fever on a farm. From this farm milk was taken to the city. Within four weeks there were fifty cases of typhoid fever in families which had been using milk from this farm. The first case on the dairy farm was brought from this city, Buffalo. The mother took care of the sick and the milk at the same time.

In April, 1895, a serious outbreak of typhoid fever occurred in the city of Stamford, Conn. It was so sudden and widespread that Dr. Lindsley, secretary of the State Board of Health, was called to make an investigation as to the cause,

and to assist in suppressing it. He reports that attention was first given to the water supply, but was soon abandoned. So, also, the food supply. It was soon discovered that sickness followed exactly the route of a certain milkman. In various parts of the city there were three hundred and eighty-six cases, of which three hundred and seventy-six were persons who used milk from this milkman, while in houses contiguous, where milk from another source was used, there were no cases. There were twenty-five deaths. The appearance of the disease was simultaneous over the district. So soon as the source of infection was discovered, the milk supply from this man was stopped, and the disease at once subsided. Investigation of the premises of the milkman revealed the fact that he washed his milk cans with water from a well which chemically showed contamination by sewage. Prudden discovered six thousand, six hundred and ninety living bacteria in a single cubic centimeter of the water.

The water in the well was only one foot and nine inches below the surface and overflowed in the spring, and surface drainage was toward the well. A shallow privy vault, leaking at the surface, was twenty-five feet distant, and free of access to a "walking case" of typhoid fever. The conclusion was irresistible that the source of this outbreak was milk, and the source of infection of the milk was the water from this well, contaminated by drainage from this privy.

The foregoing is sufficient to establish the fact that milk from infectious animals, especially from tuberculous animals, and that also from healthy animals when infected by disease germs, is dangerous and leads to a very brief consideration of the sources of infection and the remedy.

It is not necessary, as it would not be profitable, were it possible, to note in detail all the physiological or pathological processes by which the milk of a tuberculous cow is changed in the udder from a healthful and nutritious product into one carrying disease and death to those who use it. We only know that such has been demonstrated to be the fact.

I have pointed out in the instances above given, some of

the methods by which milk, after it leaves the udder, becomes infectious. While milk in the healthy cow's udder is free from bacteria, it is well known that the milk of commerce, especially as found in the cities, is swarming with these micro-organisms. Fortunately, few of these bacteria are harmful, and many are useful, if not essential.

While, therefore, milk is favorable to the growth and development of so many harmless germs, it is also favorable for the propagation of pathogenic germs.

The following are some of the methods by which these germs, beneficent and malevolent, gain access to the milk outside of the udder:

By the process of milking itself. Particles of dirt from the hands of the milker, from the teats and udder, and from the sides of the cow, fall into the pail. The pail itself may have been washed with impure water, and been imperfectly dried; or the germs may have been floating in the air and settled in the bucket before, during, or after the milking. The stables may have been in a filthy condition, and the cows lying in the filth, having it adherent to their udders, drop it into the pail. The hands of the milker are often moistened with the milk to contribute greater ease and facility to the process of milking, and drops of the milk thus used, laden with impurities, if not with filth, get into the milk.

Then, it often happens in many ways, that the milk after it leaves the dairy is infected by the addition of water, and by varying changes of temperature, especially a higher temperature, which greatly favors the rapid multiplication of the bacteriae.

Even if the milk has reached the consumer in good condition, it may become infected because of the filthy or careless habits of the inmates, or by the presence of infectious diseases in the family. It has been found in several instances that milk was infected in the dairy because of sickness in the home of the proprietor or some of the milkmen.

Is it any wonder, then, that milk should be rendered infectious? Is it not rather a miracle that the mortality from its

use is not greatly multiplied? The only remedy is suggested by the causes above enumerated and may be summed up under three heads—inspection, cleanliness, and sterilization.

All dairy cattle should be carefully inspected by a competent veterinarian, with a view to determining the presence of tuberculosis, and all diseased or suspected animals should be condemned. The habits of dairymen with respect to cleanliness, the barns, the water-supply, should all be known and recorded.

The sale of milk from dairies or private families where infectious diseases exist should be prohibited.

The strictest cleanliness of animals, persons, and surroundings should be enjoined and enforced; and the almost certainty of infection from the lack of cleanliness, as well as the terrible results so often following the use of milk so infected, should be taught in every home and school.

But with all this teaching, and the most rigid inspection, there will be vast quantities of dangerous milk sold and used, and sickness and death ensue in consequence, unless those receiving the milk resort to sterilization.

To "sterilize" milk the temperature should be raised to the boiling point, and kept there for a few minutes. It has been suggested that a few spores will, at this temperature, perhaps not be destroyed, and their presence will sooner or later cause the milk to sour, hence the milk should be subjected to two hundred and twenty degrees heat.

Both Pasteurization, and the raising of the temperature to two hundred and twenty degrees, require the use of a thermometer—an instrument that is kept in comparatively few homes, and when kept is far from being reliable. Hence I recommend as the best, because the simplest and most reliable method, the boiling of the milk. The best way is to place the milk in bottles tightly corked and boil them while immersed in water. The bottles should only be filled within two inches from the cork, so as to allow for the expansion of the milk. After boiling, the bottles should be left in the water until it is cool, as their removal while hot will break the bottles. With this simple process that can be practised in any home and by

anybody who can tell when water is boiling, there will be practically, if not absolutely, no danger from disease germs, and milk may be kept for some days, especially in a cool place, without becoming sour, or altered in any way.

Milk in larger quantities may be sterilized by being placed in tightly covered pails, or cans, and boiled in a kettle or boiler containing water.

Professor Jacobi, of New York, one of the highest authorities we have on infant feeding, etc., says: "Virtually sterilization" (by boiling) "has been practised by me more than forty years, and has been taught by me these thirty-five years, both in lectures and in books and essays. I have always urged that safety increased with the number of boilings."

There are many expensive and ingenious contrivances for sterilizing milk, but I believe that the above simple methods are not only practical and economical, but reliable.

REPORT OF THE COMMITTEE ON THE CAUSE AND PREVENTION OF DIPHTHERIA.[1]

By Dr. J. J. KINYOUN, Chairman.

Your committee has the honor to submit for your consideration, the following report:

It is intended in this report to give a short resumé of the status of diphtheria during the past year.

It is now almost a universally accepted fact that the bacillus diphtheriae is the sole cause of the disease. Formerly, the bacillus diphtheriae was supposed to cause only inflammation of the upper air passages, which are accompanied by a pseudo-membrane. This belief is slowly changing, and the term diphtheria has a broader application; for it has been satisfactorily demonstrated that many of the inflammatory affections of the nose and throat not accompanied by a false membrane, were nevertheless caused by the diphtheria germ.

While this is not being accepted as rapidly by the medical profession and laity as the health officer could wish, the number of adherents to this belief is gradually increasing.

By reason of the microscopic and culture test, we have now two classes of diphtheritic infection to deal with, the one presenting the classical and typical symptoms—the clinical diphtheria—the other, where the symptoms are slight or absent, with the bacillus present, the so-called laboratory diphtheria.

Viewed from a public health standpoint this last form is, perhaps more dangerous than the former.

The so-called membranous croup is yet, we regret to state, a most serious disturbing factor in our fight against diph-

[1] Read at the Buffalo meeting of the American Public Health Association, 1896.

theria. It is with surprise and regret that we see how firmly entrenched in the minds of the medical profession is the idea that croup is a non-infectious disease. It has been demonstrated over and over again, so plainly that he who runs may read, that nearly nine-tenths of these cases are laryngeal diphtheria. Yet despite all this, death certificates are constantly sent in to the board of health as "croup." These are the landmarks, or rather, tombstones, marking the foci of epidemics of diphtheria. It is noted with satisfaction, however, that many of our state, provincial, and municipal boards of health are beginning to be emancipated from such ideas, and now regard the terms "membranous croup" or "croup" and "diphtheria" as synonyms, and treat them accordingly.

The culture test and microscopic examination have been of great value in diminishing the number of reported cases of croup, and it is noted that they bear a direct ratio to the effectiveness of these examinations; that is to say, the more largely they are employed by the physicians, the fewer are the cases, not only of diphtheria, but of croup as well.

The diagnosis of the disease in the United States is about evenly divided between clinical methods and the culture and microscopic examination.

In Canada, the health authorities of the Province of Ontario require the diagnoses of diphtheria and croup to depend upon microscopic examination. Clinical appearances in cases where a history of exposure to previous cases is present, are also of much importance.

In the Province of Quebec, microscopic examinations are made gratuitously by the board of health, but it is optional whether the physician avails himself of them or not.

In the United States, quite a large number of the larger cities have the system of microscopic examination in operation. In one hundred and one cities having a population of 25,000 and over, thirty-six had established laboratories for this purpose, ten had only partial arrangements, usually with some member of the profession whose services were demanded in cases of doubtful diagnosis, and in fifty-five no system of any

kind was in vogue. Several of these latter (in 1896) have established laboratories. The microscopic examination in the above mentioned is not compulsory. In those places where it has been in operation for over two years, the majority of the physicians patronize it in making the diagnosis, and nearly all do so in determining when the bacillus is absent from the throats of recovered cases.

In fact, it is believed to be the rule for the health authorities to require that secondary cultures be taken in all cases before they can be released from quarantine, or the infected materials and apartments can be disinfected.

It is noted especially that the death-rate from "croup" in the cities of the United States which have not adopted microscopic examinations, is very high in proportion to the number of deaths from diphtheria, and also in proportion to the population; while on the other hand, the number of cases of death from croup in those places in which the diagnosis is made by the culture test, has fallen, and the number of cases of diphtheria has increased somewhat.

Since the adoption of this method for diagnostic purposes, there has been an increase in the number of cases of diphtheria, due in part to the croup cases, already referred to, being properly diagnosed, and the additional cases of laboratory diphtheria. It has been asserted that on account of including these latter cases the death-rate from diphtheria has not been diminished, and the statements made to the contrary are misleading. It must not be lost sight of that the microscopic examinations have been the cause of eliminating a considerable number of cases formerly classed as diphtheria.

All bacteriologists agree that about thirty per cent. of the clinically diagnosed cases are not diphtheria; these are not now returned. In the same time the cases of laryngeal diphtheria have increased and membranous croup diminished. While the above obtains in the majority of places where the microscopic examinations are made, there are instances which may be cited to the contrary. In the Province of Ontario the cases of diphtheria, so far as positive evidence can be presented,

have decreased where early diagnosis by the culture test has been made use of. In New York and Washington the death-rate has also been materially lowered.

The disease has prevailed generally throughout the United States and the Dominion of Canada during the past year. In a number of the states it has decreased or remained stationary, while in others it has assumed the proportions of an epidemic.

In 1,294 cities and towns, having in aggregate an estimated population of 23,209,937, reported 42,160 cases of diphtheria with 11,669 deaths, and 3,200 cases of croup with 2,989 deaths, a mortality rate of .46 per 100,000 for diphtheria, and .012 for croup. Statistics for comparison for 1894 are not obtainable. The percentage for diphtheria, 27 per cent.

The following will give an idea of the prevalence of diphtheria and croup in one hundred cities having in aggregate an estimated population of 13,857,562 and representing thirty-six states, during the past five years. In these cities there were fewer cases and deaths in 1895 than in 1894, as will be seen in the table beginning on page 178.

These reports show that the disease has prevailed to a greater extent in the cities of the East and Middle West, to a lesser degree in the Pacific states, and least in those of the South.

Explanations of this distribution will not be attempted further than to note the influence of climatic conditions, and less disturbance to the population by new accessions from other parts of the country.

It is to be regretted that the statistics from which these data are compiled are not more complete. Many states have a very imperfect system of their vital statistics, and while it is possible to obtain data from the majority concerning the death-rate from diphtheria and croup, it is difficult to obtain those dealing with their morbidity. This renders it extremely difficult to form a conclusion approaching accuracy.

Little, if any, information, therefore, has been obtainable concerning the prevalence of this disease in the rural districts. The information from one state and from the current medical literature shows that it has prevailed only to a

limited extent, being almost entirely confined to the cities. Report from New York state shows the following:

There were 5,098 deaths from this cause, the largest of any of the zymotic diseases, except the diarrhoeal diseases.

Of these, 1,610 occurred in the winter months, 1,259 in the spring, 966 in the summer, and 1,263 in the autumn. The largest number of deaths occurred in January. There has been a steady diminution in the mortality during the year until the usual fall increase, and this has been less than usual. There have not been so few deaths from diphtheria for several years as during 1895, the average for the three years preceding being 6,276.

As to its distribution, in relation to other diseases:

In each 1,000 deaths there were from diphtheria in the

	1895.
Maritime	52.12
Hudson Valley	29.00
Adirondack and Northern	18.80
Mohawk Valley	15.00
Southern Tier	25.25
East Central	15.80
West Central	12.25
Lake Ontario and Western	42.75
The entire state	42.00

As to distribution in relation to population, and density of population:

In each 100,000 population there were from diphtheria in the

District.	Percentage of city population.	Deaths from diphtheria, 1895.
Maritime	89.50	110.0
Hudson Valley	40.72	50.0
Adirondack and Northern	7.50	21.0
Mohawk Valley	30.93	22.0
Southern Tier	28.75	30.2
East Central	24.75	27.0
West Central	12.50	16.2
Lake Ontario and Western	64.50	65.0
Entire state	63.00	42.1

As showing the urban in contrast with the rural distribution of diphtheria in four large cities, having an aggregate population of 3,500,000, there were 3,800 deaths from this disease, giving a death-rate per 100,000 population of 108.5; in rural districts, having an aggregate population of 1,500,000 there were 400 deaths, giving a death-rate of 26.5.

In the smaller cities and large villages there were 900 deaths, which occurred in a population of 1,500,000 inhabitants, giving there a death-rate per 100,000 inhabitants of 60.00.

Manifestly diphtheria is a disease of closely aggregated communities, and its conditions of prevalence are much different from those of typhoid fever, ..."

NUMBER OF CASES OF DIPHTHERIA AND

States.	Population. 1890.	Population. 1895.	1891.	
			Cases.	Deaths.
Alabama	31,076	37,817	.....	13
Arkansas	25,874	35,000	.....	6
California	424,460	499,690	308	360
Colorado	106,713	145,000	468	175
Connecticut	212,040	219,341	505	183
Delaware	61,431	70,000	.....	71
District of Columbia	230,063	275,000	582	202
Georgia	43,189	55,000	20	12
Illinois	1,140,874	1,666,000	2,973	1,015
Indiana	221,802	260,632	882	215
Iowa	166,556	158,519	327	110
Kansas	31,007	35,000	.....	.....
Kentucky	161,129	211,000	.....	.....
Louisiana	242,039	275,000	129	56
Maine	36,425	40,000	29	6
Maryland	434,439	496,315	822	350
Massachusetts	1,016,979	1,167,897	1,591	444
Michigan	340,315	373,000	1,853	503
Minnesota	297,894	438,082	658	205
Missouri	451,770	560,000	771	249
Nebraska	140,452	140,000	429	108
New Hampshire	44,126	55,000	21	2
New Jersey	620,363	724,871	1,334	653
New York	3,029,646	3,844,904	7,037	2,634
Ohio	820,960	1,050,760	3,114	734
Oregon	46,385	81,000	54	10
Pennsylvania	1,484,070	1,722,793	4,406	1,269
Rhode Island	159,779	178,049	218	53
South Carolina	54,955	36,295	4	3
Tennessee	169,763	183,679	107	44
Texas	132,381	110,000	.....	13
Utah	44,843	70,000	218	110
Virginia	34,871	40,000	.....	.....
Washington	78,843	110,000	.....	6
West Virginia	34,522	38,000	.....	.....
Wisconsin	204,468	250,000	1,489	400
	12,476,502	13,857,562	30,349	10,214

DEATHS THEREFROM, REPORTED.

1892.		1893.		1894.		1895.	
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
.....	6	.....	3	.....	1	.....	1
.....	6	.....	9	.....	.....	.....	.....
211	259	184	194	288	206	224	55
300	89	318	106	223	64	248	40
621	229	664	237	316	166	373	123
.....	41	.....	12	.....	12	.....	12
361	121	413	159	499	176	265	66
44	19	28	12	14	6	8	6
3,497	1,041	2,604	1,002	1,921	1,298	4,329	1,441
923	240	610	150	672	134	950	170
313	78	457	96	357	59	370	50
34	3	108	35	63	14	190	41
.....	.....	.....	.....	.....	37	32	84
120	53	241	89	457	124	534	80
21	7	24	9	86	18	118	17
753	381	252	185	267	198	371	265
2,272	697	2,191	713	3,950	1,110	5,960	1,000
1,656	460	1,957	410	1,422	303	1,216	244
670	220	518	140	353	105	984	221
671	208	613	242	751	238	2,878	519
256	58	166	38	139	28	114	23
26	5	7	1	42	11	47	12
1,365	533	1,011	408	1,760	489	3,147	549
7,432	2,931	9,688	3,160	14,717	4,191	15,269	3,185
2,905	629	1,905	467	1,907	465	1,619	375
95	18	49	3	82	11	108	16
6,190	1,759	4,224	1,147	4,182	1,322	4,538	1,320
138	46	189	79	210	71	491	135
20	4	4	3	8	2	22	4
68	26	48	12	57	20	59	25
.....	15	.....	13	.....	25	.....	12
97	49	65	24	14	7	21	11
.....	.....	.....	.....	.....	.....	.....	.....
6	5	7	3	20	4	17	2
.....	.....	.....	.....	.....	.....	70	27
1,193	400	620	209	436	175	375	112
32,258	10,635	29,165	9,370	35,213	11,090	34,947	10,243

NUMBER OF CASES OF CROUP AND

States.	Population. 1890.	Population. 1895.	1891.	
			Cases.	Deaths.
Alabama	31,076	37,817	.....	13
Arkansas	25,874	35,000	.....	4
California	424,460	499,690	15	29
Colorado	106,713	145,000	.....	.....
Connecticut	212,040	219,341	67	53
Delaware	61,431	70,000	.....	.....
District of Columbia	230,063	275,000	.....	7
Georgia	43,189	55,000	.....	34
Illinois	1,140,874	1,666,000	.....	11
Indiana	221,802	260,632	.....	22
Iowa	166,556	158,519	22	22
Kansas	31,007	35,000	.....	.....
Kentucky	161,129	211,000	.....	.....
Louisiana	242,039	275,000	490	609
Maine.	36,425	40,000	.....	2
Maryland	434,439	496,315	7	.....
Massachusetts	1,016,979	1,167,897	548	503
Michigan	340,315	373,000	18	17
Minnesota	297,894	438,082	.....	49
Missouri	451,770	560,000	150	91
Nebraska	140,452	140,000	.....	.....
New Hampshire	44,126	55,000	.....	.....
New Jersey	620,363	724,871	.....	10
New York	3,029,646	3,844,904	213	327
Ohio	820,960	1,050,760	13	18
Oregon	46,385	81,000	.....	16
Pennsylvania	1,484,070	1,722,793	.....	96
Rhode Island	159,779	178,049	.....	.....
South Carolina	54,955	36,295	.....	13
Tennessee	169,763	183,679	63	503
Texas	132,381	110,000	9	182
Utah	44,843	70,000	.....	1
Virginia	34,871	40,000	.....	.....
Washington	78,843	110,000	.....	1
West Virginia	34,522	38,000	.....	.....
Wisconsin	204,468	250,000	.....	8
	12,476,502	13,857,562	1,615	2,641

DEATHS THEREFROM, REPORTED.

1892.		1893.		1894.		1895.	
Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.
.....	15	.....	16	.....	17	.....	14
1	9	.....	3	3	2	1	3
17	14	1	20	2	29	0	18
.....	.....	.....	.....	.....	.....	.....	.....
115	123	66	64	75	64	114	58
.....	.....	.....	.....	.....	.....	.....	.....
.....	7	.....	13	.....	13	.....	8
.....	42	.....	38	.....	39	.....	38
.....	11	322	255	449	350	523	352
.....	.....	34	22	34	25	36	33
14	141	11	135	16	92	23	81
.....	.....	.....	.....	1	1	10	7
.....	.....	7	14	5	23	.....	.....
530	670	552	538	486	511	428	342
5	3	8	6	5	2	9	7
.....	11	.....	18	.....	5	.....	.....
480	427	350	305	494	411	342	371
8	7	21	28	18	27	22	29
.....	12	.....	11	.....	2	.....	3
159	103	216	133	263	130	355	156
.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....
25	25	21	22	13	6	17	5
246	272	142	175	110	113	267	152
15	14	29	35	38	30	53	31
.....	34	.....	28	.....	6	.....	25
.....	110	.....	79	.....	57	.....	94
.....	.....	.....	.....	.....	.....	.....	.....
.....	3	.....	5	.....	8	.....	11
107	698	72	611	102	170	110	277
18	142	22	103	9	60	24	64
.....	.....	.....	1	.....	2	.....	4
.....	.....	.....	.....	.....	.....	.....	.....
.....	19	11	6	12	5	4	4
.....	.....	.....	.....	.....	.....	.....	.....
22	24	20	14	19	23	44	18
1,762	2,936	1,905	2,697	2,154	2,223	2,382	2,205

The vital statistics for Ontario, for the year 1895, have not been tabulated. The secretary of the board of health of the Province states "that diphtheria has been much more restricted both in its general prevalence and mortality in Ontario, in 1895, than in most previous years. The death-rate per 1,000 for the whole province, for 1894, was forty-nine; this figure is probably slightly below the figure."

There has been a decided increase of diphtheria in the Province of Quebec for 1895, over the previous year. In Montreal, the death-rate was about five and a half times greater than in 1894. In the city of Quebec and other larger towns the disease has not been especially prevalent.

The majority of cases of diphtheria are disseminated without doubt by direct contagion from child to child in the household and in the schools or other places where children are wont to congregate; indirectly, by infected apartments or articles contaminated with the germ.

Unsanitary house conditions, such as vitiated air, dampness, etc., undoubtedly affect both the number of cases and their virulence. Climatic changes may, and often do, determine an outbreak; the infection may be semi-latent, only awaiting an opportunity to manifest itself.

How far the ordinary sore throat of the adult influences the spread of the disease, is an unsettled question. A certain proportion of these are caused by the Klebs-Loeffler bacillus. From observations made in a certain place on this affection, in a hospital dispensary service, and at a time when diphtheria was not so prevalent, twenty-five per cent. of the cases of sore throat were found to be diphtheria.

It is evident that such cases are just as dangerous as those cases of laboratory diphtheria in spreading the disease.

Kober has collected statistics of twenty-eight epidemics of diphtheria which were traced to milk infection, the original source of infection coming from those persons ill with the disease handling the milk.

It is believed that the railway and steamboat passenger traffic plays no small part in the dissemination of the disease, and should demand careful attention from all health officers.

Unquestionably, the early diagnosis in suspected cases is most important of preventive measures. A prompt detection cannot be made of all cases by a clinical diagnosis—it matters not how skilful the diagnostician. To be absolutely certain, the culture test must be applied.

This is of equal importance in determining when the case has fully recovered and is no longer a menace to others.

We are of the belief that if the above diagnostic methods were generally applied and uniformly executed, the ravages of this disease would be quickly stayed, and the disease itself become one of the least disturbing factors to the public health.

Early notification of all cases of diphtheritic infection should be insisted upon. Prompt isolation of those sick—either domiciliary or hospital—private funerals, the non-transportation of corpses by train, should be enforced by law and practice. Isolation should also be made to include those who have been directly exposed to infection for a time sufficient to demonstrate their freedom from the infective agent.

Those having the bacillus in their throats should be treated as cases of diphtheria.

Great care should be exercised in the schools; they should be under the direct supervision and control of the health authorities, so far as their hygiene and sanitation is concerned. A daily medical inspection should be made of all the schools in the larger cities. This may not be practicable or necessary in small towns and rural districts; but when a case has been detected, the inspection should then be maintained for several days.

We shall now consider the prophylaxis and treatment.

Our laws and ordinances against infectious diseases have for their object the prevention and suppression. We prevent infection because the infected die; if the contrary were true, that the diseases were not so fatal, we would not be so concerned about them. If the ultimate object of these restrictive measures is to prevent death, it behooves us to use every means in our power to combat the disease. It matters not in what way we direct our efforts, provided they are successful in suppress-

ing or modifying the course of the disease. We have advocated the culture method for diagnosis for all cases of diphtheria. If this position is a correct one, and necessary, then we should advocate other measures of equal efficiency.

Two years have now elapsed since the introduction of the new remedy for the treatment and prevention of diphtheria. It is believed that there has been sufficient evidence submitted to form an unbiased opinion of its true value.

The consensus of opinion in all countries has been very favorable to its use. Its adherents now number thousands, while the opponents can be numbered as few.

The reports from the Dominion of Canada state that there has been a gradual diminution of death-rate from diphtheria, and the ratio of disease has been proportional to the use of the remedy. One report from Mexico states that it has reduced the mortality of one city forty per cent. over previous years.

In the United States the same is true. In those places where there has been the largest quantity of antitoxin used, there has been a decrease in the number of deaths over 1894, although there has been an increase in the number of reported cases.

The published reports of one hundred physicians and twenty health boards show, for the year 1895, and the first three months of 1896, that there were 7,021 cases of diphtheria treated by antitoxin with seven hundred and forty-one deaths—a death-rate of ten and six-tenths per cent., as compared with 2,936 cases of diphtheria occurring synchronously with 1,110 deaths—a death-rate of thirty-nine per cent.

The largest number of cases treated was in the cities of the East and Middle West. Of the reports of the physicians and health boards, fifty-three physicians and nine health boards were in the East, forty physicians and nine health boards in the Middle West and Northwest, two physicians and one health board in the West, and five physicians and one health board in the South. The above table in part bears out the statement that where the largest number of reports came from there have been more cases recognized as diphtheria and less as croup; while on the other hand, where the fewest reports are made the cases of croup preponderate.

Antitoxin, while believed to be a remedy par excellence, is believed to have increased the number of cases in many instances; especially is this so in the smaller places and the rural districts. The reason assigned for this is that formerly, when a child had diphtheria, it usually died, and parents kept their children away from the infected premises; now, as a rule, the rapid recovery of a child causes doubt as to the correctness of the diagnosis, and it is allowed to resume its associations with the bacilli in the throat, thereby disseminating the disease.

In the above statistics no attempt has been made to separate the cases into classes, or to exclude cases moribund when the treatment was given. They represent, it is thought, the average cases in age, duration, and severity. Care has been taken, however, to exclude from these, cases of laboratory diphtheria which are included in those who were given protective treatment.

These same reports show, that during this time—1895 and 1896—2,867 cases which were exposed to infection, in many of which the bacilli were found, were given protective doses, with the result of forty mild cases, occurring from twelve hours to thirty days after the infection.

In closing this report, your committee would recommend the following:

I. That there should be uniform rules and regulations adopted by all the states and provinces for the prevention and control of diphtheria.

The several governments should assume the responsibility and act in unison in preventing the spread of the disease from one country to another, and assume authority over interprovincial and interstate communication.

II. That it should be the duty of the health authorities to provide facilities for determining the diagnosis in all suspected cases by the establishment of inexpensive laboratories for each health jurisdiction.

To agree upon a system and means of transmission of material for diagnosis through the mails.

III. Compulsory notification of all suspected cases and the

abolition of the terms croup or membranous croup, unless diphtheria has been excluded by culture and microscopic examination.

IV. Compulsory isolation of all cases, domiciliary or in hospital, until the recovered cases show the absence of the diphtheria bacillus.

V. That the medical inspection of schools should be inaugurated under the direction and supervision of the health authorities by making daily inspections in the larger cities of all school children, for the detection of infectious disease.

In the smaller places and rural districts, the inspections, while necessary, need not be made daily, but at least once per week, and daily for several days after the appearance of a case of diphtheria.

The plan advocated by Dr. S. Durgin, of Boston, at the last meeting of this Association, is highly commended.

VI. School buildings, books, etc., should be subjected to a reliable method of disinfection at least once per month, and oftener if suspected of being infected.

VII. The early treatment of those ill with diphtheria with antitoxin, the administration of preventive doses to those who have been exposed to infection and have the bacilli in their throats.

VIII. Prompt and effective methods of disinfection of infected articles and apartments to be carried out under the supervision of the health authorities.

SUMMARY OF VITAL STATISTICS.

TABLE No. 1.

Population of Counties in 1880 and 1890.

COUNTIES.	1880.	1890.
Rockingham	49,064	49,650
Strafford	35,558	38,442
Belknap	17,048	20,321
Carroll	18,224	18,124
Merrimack	46,300	49,435
Hillsborough	75,634	93,247
Cheshire	28,734	29,579
Sullivan	18,161	17,304
Grafton	38,788	37,217
Coös	18,580	23,211
Total	346,991	376,530

Table No. 1 shows the population by counties according to the United States census of 1880 and 1890. It is from these tables that our deductions as to the population for each year are arrived at.

TABLE No. 2.

Population of New Hampshire for each Year from 1880 *to* 1895 *inclusive.*

YEARS.	Population.	YEARS.	Population.
1880.....	346,991	1888.....	370,689
1881.....	349,952	1889.....	373,650
1882.....	352,913	1890.....	376,530
1883.....	355,874	1891.....	379,491
1884.....	358,845	1892.....	382,452
1885.....	361,806	1893.....	385,413
1886.....	364,767	1894.....	388,374
1887.....	367,728	1895.....	391,335

Table No. 2 represents the population of New Hampshire for each year from 1880 to 1895 inclusive, and is calculated from the census returns of 1880 and 1890. In this table the population for each year except 1880 and 1890 is calculated, and is believed to be approximately correct. The figures in the table mentioned are estimated upon the basis that there has been a steady increase in the population in the same ratio as was shown between the census returns of the two years named.

TABLE No. 3.

Births, Marriages, and Deaths, with the Population and Rates, for 1884 *to* 1895 *inclusive.*

YEARS.	Population.	Births.	Marriages.	Deaths.	Birth-rate per 1,000.	Persons married to 1,000.	Death-rate per 1,000.
1884.....	358,845	6,247	3,292	6,194	17.40	18.34	17.26
1885.....	361,806	6,319	3,180	6,201	17.46	17.56	17.13
1886.....	364,767	6,657	3,324	6,426	18.24	18.22	17.61
1887.....	367,728	6,910	3,495	6,479	18.78	19.00	17.61
1888.....	370,689	6,443	3,379	6,854	17.38	18.22	18.48
1889.....	373,650	6,912	3,621	6,696	18.49	19.36	17.91
1890.....	376,530	6,946	3,621	7,368	18.44	19.22	19.56
1891.....	379,491	7,510	3,904	7,310	19.94	20.72	19.41
1892..... .	382,452	7,746	4,074	7,988	20.25	21.30	20.88
1893.....	385,413	8,348	4,090	7,663	22.17	21.22	20.35
1894.....	388,374	7,860	3,881	6,898	20.23	19.98	17.76
1895.....	391,335	8,252	4,015	6,929	21.08	20.52	17.71

Table No. 3 shows the population, number of births, marriages, deaths, with the birth-rate, marriage-rate, and death-rate, to each 1,000 of the population, for the years 1884 to 1895, inclusive. It will be seen by the above table that the birth and death rates were considerably lower for the years 1894 and 1895 than for several previous years. This is owing to the fact that premature and still births were excluded from the calculations in both cases, which was not done in previous years.

BIRTHS.

TABLE No. 4.

Births in Cities for 1894 *and* 1895, *with rate per* 1,000.

CITIES.	Population of 1890.	1894.		1895.	
		Births.	Birth-rate per 1,000.	Births.	Birth-rate per 1,000.
Portsmouth	9,827	185	18.83	165	16.79
Dover	12,790	285	22.28	308	24.08
Concord	17,004	462	27.17	427	25.11
Manchester	44,126	1,012	22.93	1,311	29.71
Nashua	19,311	634	32.83	630	32.62
Keene	7,446	114	15.31	148	19.87
Rochester	7,396	166	22.44	185	25.01
Laconia	6,143	224	36.46	189	30.77
Somersworth	6,207	192	30.93	199	32.06
Franklin	4,085	113	26.66	132	32.31

Table No. 4 gives the population, number of births and the birth-rate per 1,000 of the population, for the several cities of the state. It will be seen by this table that the highest birth-rate for the year 1894 was reported from Laconia, 36.46 per 1,000 of the population, and in 1895 from Nashua, 32.62. The lowest rate for the two years was reported from Keene, 15.31 in 1894, and 19.87 in 1895.

It will readily be seen that the highest birth-rates are returned from the manufacturing centres.

For the year 1894 the birth-rate for each 1,000 of the population was 20.23; for 1895, 12.08.

TABLE No. 5.

Percentage of American and Foreign Births, by Counties, 1894.

COUNTIES.	PARENTS.			Births with parentage not stated.
	American born.	Foreign born.	One foreign born.	
Rockingham	61.16	22.58	13.71	25
Strafford	40.92	47.55	10.76	6
Belknap	50.37	27.29	13.89	34
Carroll	77.35	10.37	10.37	6
Merrimack	46.52	36.40	14.26	31
Hillsborough	29.63	51.47	15.68	71
Cheshire	53.94	25.98	16.48	20
Sullivan	67.31	16.50	13.27	9
Grafton	66.12	13.34	16.49	27
Coös	26.09	47.81	20.41	39
Total for state	45.38	36.34	14.86	268

TABLE No. 6.

Percentage of American and Foreign Births, by Counties, 1895.

Rockingham	60.41	22.82	13.85	25
Strafford	40.91	43.96	12.54	22
Belknap	52.63	24.38	19.89	22
Carroll	70.72	10.19	12.50	19
Merrimack	48.41	34.15	14.35	31
Hillsborough	29.42	51.60	15.38	91
Cheshire	58.19	26.53	13.02	14
Sullivan	64.09	17.21	14.24	15
Grafton	62.91	14.44	18.88	27
Coös	30.13	48.71	17.50	24
Total for state	45.26	36.21	15.01	290

MARRIAGES.

TABLE No. 7.

Marriage-rates for 1882 *to* 1895, *inclusive.*

YEARS.	Marriages.	Persons married to 1,000 living.	Number living to one married.
1882	3,433	19.44	103
1883	3,495	19.68	102
1884	3,292	18.34	109
1885	3,180	17.56	114
1886	3,324	18.22	109
1887	3,495	19.00	105
1888	3,379	18.22	109
1889	3,621	19.36	103
1890	3,621	19.22	103
1891	3,904	20.72	97
1892	4,074	21.30	93
1893	4,090	21.22	94
1894	3,881	19.98	100
1895	4,015	20.52	97
Average	3,629	19.49	103

The total number of marriages returned for the year 1894 was 3,881, and for the year 1895, 4,015. This table shows the percentage of persons married to each 1,000 of the living population, and also the number of persons to each person married. The average number of marriages for the past fourteen years is 3,629.

TABLE No. 8.

Marriages for twelve years, 1883 *to* 1895, *inclusive, by Ages.*

SEX.	Under 20.	20 to 25.	25 to 30.	30 to 35.	35 to 40.	40 to 45.	45 to 50.	50 to 55.	55 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.
Males.....	2,194	17,599	12,602	5,573	2,978	1,758	1,197	906	640	892	317	24	690
Females....	12,656	17,792	7,829	3,268	1,945	1,127	769	501	300	314	49	1	819

TABLE No. 9.

Marriages according to Nativity.—Percentages 1882 *to* 1895, *inclusive.*

YEARS.	Both American.	Both foreign.	Groom American.	Bride American.	Not stated.
1882.....	65.74	12.09	5.13	4.14	12.90
1883.....	66.15	12.62	5.38	4.18	11.67
1884.....	69.44	12.91	5.32	3.92	8.41
1885.....	69.75	11.57	4.97	4.84	8.87
1886.....	67.87	13.39	6.50	5.08	7.16
1887.....	65.72	15.79	6.07	5.49	6.93
1888.....	64.22	17.16	7.10	6.31	5.21
1889.....	64.32	17.04	7.40	6.55	4.69
1890.....	62.19	18.58	7.53	7.15	4.53
1891.....	62.45	18.49	7.38	6.74	4.94
1892.....	59.82	21.01	7.81	6.82	4.54
1893.....	60.88	18.80	10.68	8.09	1.54
1894.....	62.12	17.34	8.32	8.25	3.97
1895.....	60.87	17.86	12.05	8.55	.67

TABLE No. 10.

Proportion of American to Foreign Born Persons Married, for 1882 *to* 1895, *inclusive.*

YEARS.	American-born.	Foreign-born.
1882	80.80	19.20
1883	80.30	19.70
1884	80.86	19.14
1885	81.92	18.08
1886	79.34	20.66
1887	76.82	23.18
1888	74.82	25.18
1889	74.80	25.20
1890	65.14	34.86
1891	73.12	26.87
1892	70.33	29.67
1893	71.37	28.63
1894	73.32	26.68
1895	71.65	28.35

Table No. 10 gives the proportion of American to foreign-born persons married for the past fourteen years. It will be seen by this table that for the year 1894, 73.32 per cent. of the persons married were American born, but by reference to Table 5 it will be observed that only 45.38 per cent. of the children born were of American parentage. For the year 1895, 71.65 per cent. of the persons married were American-born, while 45.26 per cent. of the children born in that year were of American parentage. On the other hand, reference to the same tables will show that the birth-rate is relatively very much larger among the foreign-born population.

DIVORCES.

TABLE No. 11.

Divorces Decreed from 1870 *to* 1895, *inclusive, by Counties.*

COUNTIES.	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	1890	1891	1892	1893	1894	1895
Rockingham	19	20	29	34	41	23	37	18	30	30	44	30	23	21	28	25	40	41	26	43	42	47	33	42	34	60
Strafford	12	6	24	27	25	17	20	29	29	34	58	42	36	53	32	28	46	24	41	36	38	30	30	39	38	35
Belknap	....	7	7	13	12	10	18	16	16	16	22	17	14	15	19	20	24	25	26	27	25	37	27	25	28	23
Carroll	4	1	1	9	9	4	10	13	19	13	11	19	9	7	14	20	12	12	22	20	20	17	18	20	20	25
Merrimack	15	27	32	13	51	37	40	23	22	36	41	25	49	49	48	35	46	48	49	42	53	52	55	53	50	56
Hillsborough	64	37	58	51	77	75	65	73	61	69	83	87	90	74	93	86	110	78	82	87	95	115	89	108	109	99
Cheshire	12	19	19	16	15	22	21	17	18	22	31	21	34	25	30	25	32	26	29	31	32	32	32	28	29	28
Sullivan	6	6	10	16	17	13	26	9	10	8	9	22	17	12	11	20	25	20	26	18	22	13	8	15	17	19
Grafton	13	21	15	29	22	20	20	29	17	27	25	37	27	14	28	22	30	35	40	39	33	49	38	39	47	46
Coös	4	5	2	4	12	11	9	10	11	10	15	7	15	3	12	10	17	16	18	25	22	20	17	29	26	16
Total	149	149	197	212	281	232	266	237	233	265	339	307	314	273	315	291	382	325	359	368	382	412	347	398	398	407

Table No. 11 presents an interesting study of the divorce question from the standpoint of numbers from 1870 to 1895, inclusive. It will be seen that there has been a relatively large increase in the number of divorces granted in recent years in New Hampshire.

TABLE No. 12.

Ratio of Divorces to Marriages from 1882 *to* 1895, *inclusive.*

YEARS.	Number of marriages.	Marriage-rate per 1,000	Number of divorces.	Ratio of divorces to marriages.
1882	3,433	19.44	314	1 to 10.93
1883	3,495	19.68	273	1 to 12.80
1884	3,292	18.34	315	1 to 10.45
1885	3,180	17.56	291	1 to 10.92
1886	3,324	18.22	382	1 to 8.70
1887	3,495	19.00	325	1 to 10.75
1888	3,379	18.22	386	1 to 8.75
1889	3,621	19.22	368	1 to 9.83
1890	3,621	19.22	382	1 to 9.48
1891	3,904	19.22	412	1 to 10.55
1892	4,074	21.30	347	1 to 11.74
1893	4,090	21.22	398	1 to 10.27
1894	3,881	19.98	398	1 to 9.75
1895	4,015	20.52	407	1 to 9.86

Table No. 12 gives the number of divorces decreed from 1882 to 1895, inclusive, also the ratio of divorces to marriages for the same period. Tables relating to the alleged causes of divorces may be found in the Registration Report.

DEATHS.

TABLE No. 13.

Deaths and Death-rates from 1884 *to* 1895, *inclusive.*

YEARS.	Deaths registered.	Deaths to 1,000 of population.*	Population.*
1884	6,194	16.26	358,845
1885	6,201	17.13	361,806
1886	6,426	17.61	364,767
1887	6,479	17.61	367,728
1888	6,854	18.48	370,689
1889	6,696	17.91	373,650
1890	7,368	19.56	376,530
1891	7,310	19.41	379,491
1892	7,988	20.88	382,452
1893	7,663	20.35	385,413
1894	6,898	18.32	388,374
1895	6,929	17.71	391,335
Average	6,917	18.44	.....

The number of deaths returned for the year 1894 was 6,898, and for the year 1895, 6,929. Table No. 13, above given, represents the total number of deaths registered from 1884 to 1895, inclusive, with the percentage for each year to each 1,000 of the population. The lower rates represented in the first years included in the table are, without doubt, due to the fact that a complete registration of deaths was not made to the

* Population estimated for all but census years.

state in those years. It is believed that the returns since the year 1889 have been as nearly accurate as it is possible to secure under any system of registration. For the past six years the statistics may be considered as very reliable.

TABLE No. 14.

Mortality of Males and Females compared, 1884 to 1895, inclusive.

YEARS.	Male decedents.	Female decedents.	Male decedents to 100 female decedents.	Death-rate of males to 1,000 male population.	Death-rate of females to 1,000 of female population.
1884.....	3,034	3,122	97.18	17.79	17.69
1885..	2,948	3,194	92.29	17.28	18.09
1886.....	3,155	3,212	98.20	18.50	18.20
1887.....	3,174	3,267	97.15	18.61	18.51
1888.....	3,419	3,382	101.09	20.04	19.16
1889.....	3,253	3,389	95.98	19.07	19.20
1890.....	3,692	3,624	101.87	21.65	20.53
1891.....	3,557	3,453	103.01	19.60	17.65
1892.....	3,981	3,990	99.77	21.33	21.00
1893.....	3,827	3,812	100.39	20.51	20.42
1894.....	3,392	3,498	96.97	18.18	18.41
1895.....	3,400	3,515	96.72	18.22	18.50
Average.....	3,403	3,455	99.22	19.23	18.95

Table No. 14 shows a comparison of male and female decedents for each year since 1884 to 1895, inclusive, together with percentages and death-rates for each to each 1,000 of the population. The average annual mortality for the twelve years embraced in the table was, males, 3,403; females, 3,455.

TABLE No. 15.

Deaths at Age Periods, by Percentages, from 1883 *to* 1895, *inclusive.**

YEARS.	Under 1.	1 to 5.	5 to 10.	10 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	Over 60.
1883.....	14.33	7.58	2.56	5.55	8.58	6.73	6.22	7.64	37.93
1884.....	16.22	7.36	2.61	5.30	7.93	6.26	6.33	7.75	38.38
1885.....	15.98	7.14	2.11	4.42	7.50	6.71	6.71	7.76	40.09
1886.....	16.89	7.70	2.86	4.82	7.73	6.55	6.12	7.47	38.86
1887.....	17.64	7.26	2.05	4.89	6.96	6.25	6.56	7.72	39.70
1888.....	19.23	7.63	2.04	4.93	7.07	6.00	5.53	7.57	38.72
1889.....	19.44	7.71	2.66	4.64	6.56	6.15	5.93	7.63	38.40
1890.....	16.23	6.67	1.99	4.28	7.04	7.42	6.62	9.17	40.49
1891.....	18.30	7.08	2.55	4.40	6.95	6.01	6.29	8.15	40.25
1892.....	16.17	6.64	2.18	4.39	6.70	6.63	6.60	8.76	41.77
1893.....	17.83	7.13	1.93	4.32	7.20	6.62	6.94	8.10	39.86
1894.....	17.52	7.31	2.47	3.89	7.06	7.03	6.35	8.54	39.78
1895.....	17.10	7.06	2.09	4.21	6.99	5.82	6.66	8.18	41.88

*Not including those with age not stated, premature and still-births.

Table No. 15 exhibits the percentage of deaths at age periods, 1883 to 1895, inclusive. It is remarkable with what uniformity the death-rate at different age periods is maintained.

TABLE No. 16.

Deaths at Different Periods, compared with the number Living at the Same Period, 1894.*

	1894.	Persons living at same ages, census of 1880.	Death-rate per 1,000.
Under 1 year	1,196	6,141	194.76
Under 5 years	1,695	30,573	55.44
20 to 30 years	482	63,252	7.62
All others	4,721	253,166	18.65
All ages	6,898	376,530†	18.32

TABLE No. 17.

Deaths at Different Periods, compared with the number Living at the Same Period, 1895.

	1895.	Persons living at same ages, census of 1880.	Death-rate per 1,000.
Under 1 year	1,170	6,141	190.52
Under 5 years	1,653	30,573	54.06
20 to 30 years	398	63,252	6.29
All others	4,878	253,166	19.27
All ages	6,929	376,530†	18.40

* Excluding still-births and premature births. † Census of 1890.

Tables Nos. 16 and 17 show the number of deaths at different age periods compared with the number living for the same period, 1894 and 1895.

These tables exhibit most vividly the heavy mortality among children under five years of age.

TABLE No. 18.

*Deaths of Children under Five Years of Age, by Seasons, 1894.**

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Months	133	125	103	118	104	87	230	238	181	149	100	116
Quarters		361			309			649			365	
Percentages		21.44			18.35			38.54			21.67	
Half-years			670						1,014			
Percentages			39.79						60.21			
Total deaths						1,684						

* Not including deaths with month not stated, premature and still-births.

TABLE No. 19.

*Total Deaths by Seasons, 1895.**

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Months	111	115	132	118	104	101	189	242	222	137	93	87
Quarters		358			323			653			317	
Percentages		21.68			19.56			39.55			19.20	
Half-years			681						970			
Percentages			41.25						58.75			
Total deaths						1,651						

* Not including deaths with month not stated, premature and still-births.

Tables 18 and 19 show the mortality among children under five years of age, by seasons, for the years 1894 and 1895. The highest mortality for both years, as it was in previous years, was in the quarter including the months of July, August, and September. The heavy death-rate among children in the

summer months is due largely to cholera infantum and other diarrhœal diseases.

TABLE No. 20.

Total Deaths by Seasons, 1894.*

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Months	743	559	588	549	499	494	629	653	590	562	509	507
Quarters		1,890			1,542			1,872			1,578	
Percentages		27.46			22.41			27.20			22.93	
Half-years			3,432						3,450			
Percentages			49.87						50.13			
Total deaths							6,882					

*Not including deaths with month not stated, premature and still-births.

TABLE No. 21.

Total Deaths by Seasons, 1895.*

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
Months	591	581	750	633	539	450	547	669	599	562	505	496
Quarters		1,922			1,622			1,815			1,563	
Percentages		27.77			23.43			26.22			22.57	
Half-years			3,544						3,378			
Percentages			51.20						48.80			
Total deaths							6,922					

*Not including deaths with month not stated, premature and still-births.

Tables 20 and 21 give the total number of deaths, at all ages, by seasons, for the years 1894 and 1895.

TABLE No. 22.

Mortality from Prominent Zymotic Diseases from 1884 to 1895, inclusive.

YEARS.	DISEASES.												
	Cholera infantum.	Croup.	Diarrhœa.	Diphtheria.	Dysentery.	Erysipelas.	Fever, cerebro-spinal.	Fever, typhoid.*	Measles.	Pertussis.	Scarlatina.	Septicæmia.	Total.
1884.....	266	49	53	110	80	19	25	137	3	14	52	27	835
1885.....	219	74	59	78	40	25	20	136	45	25	53	38	812
1886.....	362	64	38	156	79	18	26	194	18	26	21	27	1,029
1887.....	336	84	38	177	53	20	34	134	39	21	26	30	992
1888.....	370	94	50	103	63	36	34	150	55	23	34	29	1,041
1889.....	353	88	68	210	67	27	25	161	16	47	18	29	1,109
1890.....	399	64	50	164	48	29	....	143	9	26	16	57	1,005
1891.....	486	56	46	160	51	43	....	170	19	27	13	38	1,109
1892.....	366	45	53	134	42	39	19	109	24	37	27	47	942
1893.....	423	36	50	63	63	29	3	121	32	23	52	43	938
1894.....	400	44	45	73	41	16	....	135	14	51	61	50	930
1895.....	411	49	44	78	39	18	....	99	7	26	58	51	880
Average.	366	62	49	125	55	26	15	141	23	29	36	39	968

* Including fever, bilious, intermittent, malarial, and typho-malarial fevers.

Table No 22 exhibits the number of deaths from the more prominent so-called zymotic diseases, 1884–1895, inclusive. This table presents an interesting study in showing the fluctuations in these diseases from year to year. It will be seen that of all the diseases in this class, cholera infantum causes the greatest number of deaths, while typhoid fever holds the second place, and diphtheria the third. The total number of deaths in this class in 1895 was considerably less than for several years previous.

TABLE 23.

Mortality from Principal Constitutional Diseases from 1894 *to* 1895, *inclusive.*

YEARS.	DISEASES.										
	Dropsy.	Anæmia.	Cancer.	Mortification.	Rheumatism.	Scrofula.	Tabes mesenterica.	Phthisis (pulmonary).	Hydrocephalus.	Tubercular meningitis.	Total.
1884	80	43	213	18	26	26	4	865	27	*	1,302
1885	90	32	212	24	28	22	2	857	25	*	1,292
1886	83	28	206	27	47	16	11	809	33	19	1,279
1887	79	17	218	29	47	16	7	766	23	16	1,218
1888	75	34	203	22	43	21	14	742	30	13	1,197
1889	62	40	213	21	43	22	13	651	21	24	1,110
1890	53	28	276	33	30	15	6	825	13	30	1,309
1891	41	41	213	2	24	11	19	695	22	15	1,083
1892	43	35	235	24	25	17	10	736	16	24	1,165
1893	49	26	283	30	27	14	21	737	23	27	1,237
1894	42	32	230	25	19	10	21	714	22	22	1,137
1895	35	37	266	42	23	7	21	693	23	20	1,167
Average	61	33	231	25	32	16	12	757	23	17	1,208

* Not classed separately.

Table 23 gives the number of deaths, 1884–1895, inclusive, from the so-called constitutional diseases. Phthisis, which is the most fatal of all the diseases in this class, was the cause of 714 deaths in 1894, and 693 in 1895, the latter number being less than has been reported in several years. A careful study of the subject leads us to believe that the mortality from this disease is slowly diminishing.

There is a remarkable uniformity in the mortality from some of the diseases in this table, and especially is this true of cancer.

TABLE No. 24.

Mortality from Principal Local Diseases from 1884 *to* 1895, *inclusive.*

YEARS.	DISEASES.												
	Apoplexy.	Paralysis.	Convulsions.	Cephalitis.*	Brain disease.	Heart disease.	Bronchitis.	Pneumonia.	Enteritis.	Gastritis.	Peritonitis.	Liver disease.	Bright's disease, nephritis and other kidney diseases.	Total.
1884	192	248	99	120	134	507	78	436	69	44	61	63	140	2,191
1885	206	278	93	133	122	489	112	504	57	49	44	63	157	2,307
1886	220	249	71	141	127	510	81	466	53	66	48	71	143	2,246
1887	210	253	64	117	121	552	114	556	57	54	48	69	163	2,384
1888	243	273	88	143	112	575	142	628	39	51	63	72	154	2,634
1889	259	196	76	151	126	564	127	582	56	42	57	56	200	2,492
1890	263	251	65	186	140	568	194	703	63	60	51	56	201	2,801
1891	283	241	78	161	130	572	180	673	73	47	68	55	182	2,743
1892	308	209	78	188	140	571	217	890	72	68	94	48	222	3,105
1893	331	239	76	208	122	605	191	685	76	56	78	65	194	2,926
1894	294	248	78	223	143	649	195	633	65	51	73	64	186	2,902
1895	321	252	94	227	136	691	187	639	64	51	73	74	225	3,034
Average..	261	244	80	166	129	571	151	616	62	53	63	63	181	2,647

* Meningitis and cerebritis included.

Table 24 gives the mortality from the principal local diseases, so-called, from 1884 to 1895, inclusive. The average number of deaths from this class of diseases, since 1884, has been 2,647; for 1895 it was 3,034, a larger number than ever before returned in a single year. This table presents many interesting features for careful study.

TABLE 25.

Mortality from Principal Developmental Diseases from 1884 *to* 1895, *inclusive.*

YEARS.	DISEASES.									
	Stillborn.	Debility, infantile.	Debility, premature birth.	Malformation.	Teething.	Innutrition.	Childbirth.	Old age.	Atrophy and debility.	Total.
1884.....	156	*	35	13	19	*	27	457	144	851
1885.....	145	*	39	13	13	*	31	420	167	828
1886.....	140	68	54	12	16	50	30	468	98	936
1887.....	166	56	63	10	20	76	27	449	78	945
1888.....	189	91	69	19	20	81	20	407	112	1,008
1889.....	220	79	68	24	18	63	27	426	104	1,029
1890.....	197	113	65	11	15	95	28	410	204	1,138
1891.....	213	104	73	18	14	90	23	385	208	1,128
1892.....	205	101	82	21	11	81	19	441	75	1,036
1893.....	203	90	102	12	12	100	22	402	94	1,037
1894..... ...	452	153	99	16	16	49	20	358	101	1,264
1895.....	451	187	105	16	19	11	28	376	77	1,270
Average. .	228	87	71	15	16	58	25	416	122	1,039

* Classed with atrophy and debility.

Table 25 shows the mortality from the principal developmental diseases from 1884 to 1895, inclusive.

TABLE No. 26.

Mortality from Twenty Prominent Causes from 1884 *to* 1895, *inclusive.*

CAUSES OF DEATH.	Deaths in 1895.	ORDER OF FATALITY.											
		1895	1894	1893	1892	1891	1890	1889	1888	1887	1886	1885	1884
Consumption	693	1	1	1	2	1	1	1	1	1	1	1	1
Pneumonia	639	3	3	2	1	2	2	2	2	3	5	2	5
Heart disease	691	2	2	3	3	3	3	3	3	2	2	4	
Apoplexy and paralysis	573	4	4	4	4	4	4	4	4	4	3	3	4
Old age	376	6	6	6	5	6	5	5	5	5	4	5	3
Cholera infantum	411	5	5	5	6	5	6	6	6	6	6	6	6
Cancer	266	7	7	8	8	8	7	7	7	7	7	7	7
Diphtheria	78	18	19	19	13	13	12	8	15	9	10	18	13
Accident and negligence	224	9	9	7	9	7	8	9	8	8	9	8	11
Typhoid fever*	99	15	13	13	15	11	13	10	9	10	8	9	10
Cephalitis†	227	8	8	9	11	12	11	11	10	12	11	10	12
Diarrhœa and dysentery	83	17	17	14	17	18	17	12	12	14	13	15	9
Bright's disease	140	12	15	11	12	14	16	13	19	15	15	14	14
Bronchitis	187	10	10	10	10	10	10	14	11	13	17	12	17
Brain disease	136	13	12	12	14	16	14	15	13	11	12	11	8
Atrophy and debility	77	19	16	15	19	9	9	16	14	18	14	13	18
Croup	49	20	20	20	20	20	20	17	16	16	21	19	22
Debility, infantile	187	11	11	17	16	17	15	18	17	23	22	‡	....
Convulsions	94	16	18	18	18	19	19	19	18	21	19	16	15
Influenza	121	14	14	16	7	15	18	....	....	....	....	....	....

* Fever, bilious fever, malarial, intermittent, and typho-malarial fevers included. † Meningitis and cerebritis included. ‡ Classed with atrophy and debility.

Table No. 26 shows the mortality from twenty prominent causes of death from 1884 to 1895, inclusive. In this table, consumption heads the list, as it has always done, with one exception of the year 1892, when pneumonia ranked first and consumption second. This was doubtless due to the prevalence of La Grippe. The mortality from the causes named, for the year 1895, is shown in the first column; the number for each of the other years may be found by consulting the Registration Report for the given year. These diseases are placed in the order of their fatality, and the fluctuation in this order from year to year is shown by the figures in the columns under the respective years.

TABLE No. 27.

Mortality from Consumption from 1884 *to* 1895, *inclusive.*

YEARS.	Deaths.	Percentages of deaths to deaths from all causes.	Death-rate per 10,000 living population.
1884	865	14.01	24.18
1885	857	13.82	23.68
1886	809	12.58	22.17
1887	766	11.82	20.82
1888	742	10.82	20.01
1889	651	9.72	17.42
1890	825	11.19	21.91
1891	695	9.51	18.31
1892	736	9.21	19.24
1893	737	9.62	19.13
1894	714	10.35	18.38
1895	693	10.00	17.71

Table No. 27 shows the mortality from consumption from 1884–1895, inclusive, the percentage of deaths to deaths from all diseases, and the death-rate per 10,000 of the living population.

In the following tables, Nos. 28 to 47, inclusive, will be found a statement of deaths from pulmonary consumption, by seasons, ages, and nativity, for all the cities of the state. These tables are given, together with others, for the purpose of furnishing all the data possible in relation to this, the most fatal of all diseases.

TABLE No. 28.

Deaths from Pulmonary Consumption, by Seasons, Ages, and Nativity, 1894, for the City of Manchester.

Months	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	American.	Foreign.	Not stated.
	7	3	9	5	11	8	10	10	7	9	6	7				
Quarters	19			24			27			22			92			
Ages	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.					
	10		10	29	17	13	7	3	2	1			92			
Nativity	.....			.....			.....			.....			....	55	33	4
Males	.....			.....			.....			.....			35	..	..	..
Females	.....			.....			.....			.....			57	..	..	..

TABLE No. 29.

Deaths from Pulmonary Consumption, by Seasons, Ages, and Nativity, 1895, for the City of Manchester.

Months	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	American.	Foreign.	Not stated.
	8	12	7	5	8	4	2	7	5	10	7	8				
Quarters	27			17			14			25			83			
Ages	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.					
	2	2	6	31	17	12	7	3	2	1			83			
Nativity	.....			.....			.....			.....			....	37	42	4
Males	.....			.....			.....			.....			39	...	..	..
Females	.....			.....			.....			.....			44	...	..	..

TABLE No. 30.

Deaths from Pulmonary Consumption, by Seasons, Ages, and Nativity, 1894, for the City of Concord.

Months	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	American.	Foreign.	Not stated.
	3	3	3	5	2	6	2	1	2	5	5	1				
Quarters		9			13			5			11		38			
Ages	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.					
	3		3	8	8	10	3	1	2				38			
Nativity														25	12	1
Males													13	..	..	..
Females													25	..	..	..

TABLE No. 31.

Deaths from Pulmonary Consumption, by Seasons, Ages, and Nativity, 1895, for the City of Concord.

Months	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	American.	Foreign.	Not stated.
	2	2	1	5	2	1	4	2	2	2	4	4				
Quarters		5			8			8			10		31			
Ages	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.					
	2		2	8	7	5	3	2	2				31			
Nativity														25	4	2
Males													17	..	..	..
Females													14	..	..	..

TABLE No. 32.

Deaths from Pulmonary Consumption, by Seasons, Ages, and Nativity, 1894, for the City of Nashua.

Months	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total	American.	Foreign.	Not stated.
	3	1	4	3	3	6	1	5	1	2	3	1				
Quarters		8			12			7			6		33			
Ages	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.					
	3	1	6	12	5	4		2					33			
Nativity														16	15	2
Males													10	..	..	..
Females													23	..	..	..

TABLE No. 33.

Deaths from Pulmonary Consumption, by Seasons, Ages, and Nativity, 1895, for the City of Nashua.

Months	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	American.	Foreign.	Not stated.
	3	1	1	2	2	5	4	6	4	1		1				
Quarters		5			9			14			2		30			
Ages	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.					
	1	2	4	11	9	1	2						30			
Nativity														22	7	1
Males													10	..	..	..
Females													20	..	..	..

TABLE No. 34.

Deaths from Pulmonary Consumption, by Seasons, Ages, and Nativity, 1894, for the City of Portsmouth.

Months	3 January.	Febuary.	3 March.	1 April.	May.	6 June.	1 July.	August.	1 September.	5 October.	3 November.	2 December.	Total.	American.	Foreign.	Not stated.
Quarters		6			7			2			10		25			
Ages	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.					
		2	1	9	6	2	4		1				25			
Nativity													19	6	..	
Males													10	..	..	..
Females													15	..	..	..

TABLE No. 35.

Deaths from Pulmonary Consumption, by Seasons, Ages, and Nativity, 1895, for the City of Portsmouth.

Months	2 January.	3 Febuary.	5 March.	5 April.	5 May.	4 June.	2 July.	1 August.	3 September.	3 October.	3 November.	2 December.	Total.	American.	Foreign.	Not stated.
Quarters		10			14			6			8		38			
Ages	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.					
	1	1	5	15	7	4	3		2				38			
Nativity													33	5	..	
Males													19	..	..	..
Females													19	..	..	..

TABLE No. 36.

Deaths from Pulmonary Consumption, by Seasons, Ages, and Nativity, 1894, for the City of Dover.

Months	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	American.	Foreign.	Not stated.
	4	6	2	1	3	1	2	2	1	3	1	3				
Quarters		12			5			5			7		29			
Ages	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.					
	1		5	7	10	3	1	1	1				29			
Nativity														17	9	3
Males													16	..	..	..
Females													13	..	..	..

TABLE No. 37.

Deaths from Pulmonary Consumption, by Seasons, Ages, and Nativity, 1895, for the City of Dover.

Months	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	American.	Foreign.	Not stated.
	2	6	1	3	3	2	1	1	2	1	1					
Quarters		9			8			4			2		23			
Ages	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.					
	1	1	1	5	2	1	4	5	3				23			
Nativity														15	7	1
Males													11	..	..	..
Females													12	..	..	..

TABLE No. 38.

Deaths from Pulmonary Consumption, by Seasons, Ages, and Nativity, 1894, for the City of Keene.

Months	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	American.	Foreign.	Not stated.
	3		4	1		2	1			1	1	1				
Quarters		7			1			1			3		12			
Ages	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.					
				2	1	1	1	2	3	1	1		12			
Nativity														7	4	1
Males													7			
Females													5			

TABLE No. 39.

Deaths from Pulmonary Consumption, by Seasons, Ages, and Nativity, 1895, for the City of Keene.

Months	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	American.	Foreign.	Not stated.
	2			1	4	2	2	1				2				
Quarters		2			7			3			2		14			
Ages	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.					
				7	3	1		1	2				14			
Nativity														13	1	
Males													9			
Females													5			

TABLE No. 40.

Deaths from Pulmonary Consumption, by Seasons, Ages, and Nativity, 1894, for the City of Rochester..

Months	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	American.	Foreign.	Not stated.
	3	1	1	1		2	1	2				1				
Quarters		5			3			3			1		12			
Ages	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.					
			3	3	3		3						12			
Nativity													....	8	4	..
Males													5	..	..	..
Females													7	..	..	..

TABLE 41.

Deaths from Pulmonary Consumption, by Seasons, Ages, and Nativity, 1895, for the City of Rochester.

Months	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	American.	Foreign.	Not stated.
	3		1	3	1	2		1	2		1	1				
Quarters		4			6			3			2		15			
Ages	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.					
		1	1	5	2	3	1		1		1		15			
Nativity													....	10	3	2
Males													7	..	..	..
Females													8	..	..	..

TABLE No. 42.

Deaths from Pulmonary Consumption, by Seasons, Ages, and Nativity, 1894, for the City of Laconia.

Months	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	American.	Foreign.	Not stated.
	1	4	2	3	1	2	2	2	2	3	2	2				
Quarters		7			6			4			7		24			
Ages	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.					
	7		2	5	3		3	1	1	2			24	..	..	..
Nativity	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	...	18	5	1
Males	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17	..	..	..
Females	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	..	..	..

TABLE No. 43.

Deaths from Pulmonary Consumption, by Seasons, Ages, and Nativity, 1895, for the City of Laconia.

Months	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	American.	Foreign.	Not stated.
		2	2		1	2		1	1	2	1	1				
Quarters		4			3			2			4		13			
Ages	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.					
	2			5	1	1	3	1					13			
Nativity	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	7	5	1
Males	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	..	..	..
Females	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	..	..	..

TABLE No. 44.

Deaths from Pulmonary Consumption, by Seasons, Ages, and Nativity, 1894, for the City of Somersworth.

Months	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	American.	Foreign.	Not stated.
				1	3	1		2			1	2				
Quarters				5			2			3			10			
Ages	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.					
			2	2	3	1			2				10	..	..	..
Nativity													....	5	3	2
Males													4	..	..	..
Females													6	..	..	..

TABLE No. 45.

Deaths from Pulmonary Consumption, by Seasons, Ages, and Nativity, 1895, for the City of Somersworth.

Months	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	American.	Foreign.	Not stated.
			2		1	2	2			1						
Quarters		2			3			2			1		8			
Ages	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.					
	1	1		2	1	1	1		1				8			
Nativity													....	7	1	..
Males													4	..	..	..
Females													4	..	..	..

TABLE No. 46.

Deaths from Pulmonary Consumption, by Seasons, Ages, and Nativity, 1894, for the City of Franklin.

Months	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	American.	Foreign.	Not stated.
	1		1		1	1		1	3							
Quarters		2			2			4					8			
Ages	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.					
	1			5	1				1				8			
Nativity	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	5	3	..
Males	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	..	..	..
Females	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	..	..	..

TABLE No. 47.

Deaths from Pulmonary Consumption, by Seasons, Ages, and Nativity, 1895, for the City of Franklin.

Months	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	American.	Foreign.	Not stated.
			1				1		1	1	2					
Quarters		1						2			3		6			
Ages	Under 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Not stated.					
		1		2	2	1							6			
Nativity	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	2	4	..
Males	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	..	..	..
Females	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	..	..	..

PNEUMONIA.

TABLE No. 48.

Mortality from Pneumonia, by Counties, from 1884 *to* 1895, *inclusive.*

COUNTIES.	YEARS.												Average.
	1884	1885	1886	1887	1888	1889	1890	1891	1892	1893	1894	1895	
Rockingham	45	63	77	70	83	66	90	77	96	88	83	83	77
Strafford	39	48	37	46	52	38	80	73	96	65	66	58	58
Belknap	18	24	25	44	50	37	42	28	55	31	46	29	36
Carroll	30	27	15	33	46	49	37	42	50	19	32	28	34
Merrimack	50	72	60	85	73	86	94	73	137	95	85	83	83
Hillsborough	110	128	112	128	129	131	158	185	175	159	154	175	145
Cheshire	36	52	39	55	55	52	44	54	86	64	50	44	53
Sullivan	21	22	23	22	30	31	32	31	62	45	31	32	32
Grafton	66	48	54	52	77	64	74	53	84	71	53	66	64
Coös	21	20	24	21	33	26	52	57	49	48	33	41	35
Total	436	504	466	556	628	582	703	673	890	685	633	639	616

Table No. 48 shows the number of deaths from pneumonia, by counties, 1884 to 1895, inclusive, with the total and average numbers for the entire period. The average for the entire state for the twelve years included was 616, while for the last two years the mortality was 633 and 639, respectively.

TABLE No. 49.

Mortality from Pneumonia, by Months and Quarters, from 1884 *to* 1895, *inclusive.*

YEARS.	January.	February	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Not stated.
1884.....	55	55	51	52	32	13	14	11	5	28	51	67	2
1885.....	53	59	101	95	35	25	13	10	10	33	38	32	..
1886.....	32	44	73	51	51	33	22	18	18	24	46	54	..
1887.....	71	73	85	85	49	17	13	13	14	34	47	54	1
1888.....	72	95	75	73	76	24	16	23	21	43	36	72	2
1889.....	69	66	79	102	51	22	15	19	16	53	41	49	..
1890.....	213	74	69	43	47	35	18	9	23	23	69	79	1
1891.....	73	60	82	72	95	41	13	7	14	23	37	152	4
1892.....	384	110	83	86	57	21	5	11	19	21	34	54	5
1893.....	75	71	95	87	67	38	18	14	14	24	48	133	1
1894.....	141	91	66	75	57	30	16	17	18	27	47	47	1
1895.....	89	91	141	78	34	29	14	15	16	29	35	66	2
Total.....	1327	889	1000	899	651	328	177	167	188	362	529	869	..
	3,216.			1,878.			532.			1,760.			

The mortality from pneumonia, by months and quarters, for the past twelve years, is shown in Table No. 49. A study of the mortality rates by quarters shows that the greatest fatality is in the first quarter of the year, while the fewest number of cases occur during the summer months of July, August, and September. It will, of course, be readily understood that climatic conditions are responsible for the fluctuation in the mortality from this disease.

BRAIN DISEASES.

TABLE No. 50.

Mortality from Brain Diseases from 1884 *to* 1895, *inclusive.*

YEARS.	DISEASES.						
	Cephalitis.*	Apoplexy.	Paralysis.	Insanity.	Convulsions.	Brain diseases.	Total.
1884	120	192	248	22	99	134	815
1885	133	206	278	27	93	122	859
1886	141	220	249	24	71	127	832
1887	117	210	253	25	64	121	790
1888	143	243	273	37	88	112	896
1889	151	259	196	35	76	126	843
1890	186	263	251	28	65	140	933
1891	161	283	241	44	78	130	917
1892	173	308	209	33	78	140	941
1893	208	331	239	26	76	122	1,002
1894	223	294	248	30	78	143	1,016
1895	227	321	252	16	94	136	1,046
Average	165	261	245	29	80	129	907

* Meningitis and Cerebritis included.

Table No. 50 shows the number of deaths from brain diseases from 1884 to 1895, inclusive. In this class there has been an increase in the mortality, the number returned in 1895 being larger than in any other year.

DIARRHŒAL DISEASES.

TABLE No. 51.

Mortality from Diarrhœal Diseases from 1884 *to* 1895, *inclusive.*

YEARS.	DISEASES.					Total of diarrhœal diseases.
	Cholera infantum.	Cholera morbus.	Diarrhœa.	Dysentery.	Enteritis.	
1884	266	21	52	80	69	488
1885	219	20	40	40	57	376
1886	362	14	38	79	53	546
1887	336	16	38	53	57	500
1888	370	8	50	63	39	530
1889	353	12	68	67	56	556
1890	399	12	.....	50	63	524
1891	486	16	46	51	73	672
1892	366	17	53	42	72	550
1893	423	20	50	63	76	632
1894	400	17	45	41	65	568
1895	411	18	44	39	64	576
Average	366	16	44	56	62	543

Table No. 51 gives the mortality from diarrhœal diseases from 1884 to 1895, inclusive. In this group of diseases, cholera infantum causes the greatest number of deaths, the mortality being excessive. A study of the Registration reports will disclose the fact that this disease is confined almost entirely to the cities of the state, the highest rate being in the city of Manchester.

CHOLERA INFANTUM.

TABLE No. 52.

Mortality from Cholera Infantum from 1884 *to* 1895, *inclusive.*

YEARS.	Deaths.	Percentage of deaths to deaths from all causes.	Death-rates per 10,000 living (estimated population.)
1884	266	4.29	7.41
1885	219	3.53	6.05
1886	362	5.63	9.92
1887	336	5.18	9.13
1888	370	5.39	9.98
1889	353	5.27	9.44
1890	399	5.41	10.59
1891	486	6.64	12.08
1892	366	4.58	9.57
1893	423	5.52	10.97
1894	400	5.80	10.38
1895	411	5.93	10.50

The above table, No. 52, gives the mortality from cholera infantum for the past twelve years, with percentage to deaths from all causes and rate per 10,000 of the living population. The number of deaths from this disease in the year 1894 was 400, and in 1895, 411. The average yearly mortality from cholera infantum since 1884 has been 366. The mortality from this disease could be very largely reduced by sanitary measures, and the subject should be considered by local boards of health.

CANCER.

TABLE No. 53.

Mortality from Cancer, with rates to estimated Population and to total Mortality from 1884 *to* 1895, *inclusive.*

YEARS.	Deaths.	Death-rates per 10,000 of estimated population.	Ratio to total mortality per 1,000.
1884	213	5.93	34.39
1885	212	5.85	34.19
1886	206	5.64	32.06
1887	218	5.92	33.65
1888	203	5.47	29.62
1889	213	5.70	31.81
1890	276	7.33	37.45
1891	213	5.61	30.32
1892	235	6.14	29.41
1893	283	7.34	30.67
1894	230	5.92	33.34
1895	266	6.79	38.39

Table No. 53 gives the number of deaths from cancer, with rates to the estimated population and to the mortality from other diseases, 1884 to 1895, inclusive. The most remarkable feature of this table is the striking uniformity in the number of deaths from this disease annually.

DIPHTHERIA.

TABLE No. 54.

Mortality from Diphtheria from 1884 *to* 1895, *inclusive, by Ages.*

YEARS.	Under 1.	1 to 5.	5 to 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Unknown.	Total.
1884.....	8	39	34	17	4	2	....	1	3	....	....	1	1	110
1885.....	10	32	22	5	3	4	....	1	1	....	....	...	...	78
1886.....	9	53	58	22	7	3	1	1	2	....	....	...	...	156
1887.....	7	74	51	20	6	9	4	2	1	1	1	...	1	177
1888.....	6	43	36	7	4	2	1	1	2	1	....	...	...	103
1889.....	7	86	68	18	13	10	3	3	....	1	....	...	1	210
1890.....	6	64	45	26	10	3	4	3	....	....	....	1	2	164
1891.....	5	74	48	17	7	2	4	....	....	1	....	...	2	160
1892.....	9	54	37	14	5	6	2	2	....	2	....	...	3	134
1893.....	6	23	19	9	1	3	1	1	....	....	....	...	...	63
1894.....	10	33	19	5	....	2	2	1	....	....	....	1	...	73
1895.....	3	31	26	5	3	4	1	1	1	....	1	...	2	78

Table No. 54 shows the mortality from diphtheria by age-periods, from 1884 to 1895, inclusive. It is gratifying to observe that for the past three years the mortality from this disease has been considerably less than for several years prior to 1893. There was a steady diminution in the mortality from this disease from 1889 to, and including, 1893, while for 1894 and 1895 there was a slight increase over that year. The precautions taken by local boards of health against the spread of diphtheria doubtless account for the diminished mortality.

CROUP.

TABLE No. 55.

Mortality from Croup from 1884 *to* 1895, *inclusive, by Ages.*

YEARS.	Under 1.	1 to 5.	5 to 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Unknown.	Total.
1884.....	8	35	6	....	....	....	....	....	....	....	....	....	...	49
1885.....	20	41	9	....	....	1	2	....	1	....	....	....	..	74
1886.....	13	40	10	1	....	....	....	....	....	....	....	....	...	64
1887.....	26	48	7	2	....	....	....	....	....	....	1	....	...	84
1888.....	16	67	9	....	....	....	1	....	....	....	1	....	...	94
1889.....	11	65	11	1	....	....	....	....	....	....	....	....	...	88
1890.....	16	41	6	1	....	....	....	....	....	....	....	....	...	64
1891.....	11	32	10	2	...	....	....	....	....	....	....	....	1	56
1892.....	6	32	5	1	1	....	....	....	....	....	....	....	...	45
1893.....	8	16	10	2	....	....	....	....	....	....	....	....	...	36
1894.....	10	24	9	1	....	....	....	....	....	....	....	....	...	44
1895.....	7	34	7	1	....	....	....	....	....	....	....	....	...	49

Table No. 55 shows the mortality from croup for the past twelve years. This table corresponds in rates very closely to the preceding table relating to diphtheria. Indeed, there is no reason why it should not, inasmuch as diphtheria and membranous croup are, in our opinion, one and the same disease, differing only in manifestation. When there is a revision of the classification of disease, it is probable that croup will be merged into diphtheria.

CROUP AND DITHTHERIA.

TABLE No. 56.

Mortality from Croup and Diphtheria from 1884 *to* 1895, *inclusive.*

YEARS.	Deaths.			Percentages of deaths to deaths from all causes.			Death-rates per 10,000 living.		
	Croup.	Diphtheria.	Total.	Croup.	Diphtheria.	Total.	Croup.	Diphtheria.	Total.
1884.....	49	110	159	.79	1.77	2.56	1.36	3.06	4.42
1885.....	74	78	152	1.19	1.25	2.44	2.04	2.15	4.19
1886.....	64	156	220	.99	2.41	3.40	1.75	4.27	6.02
1887.....	84	177	261	1.29	2.73	4.02	2.28	4.81	7.09
1888.....	94	103	197	1.37	1.50	2.87	2.53	2.77	5.30
1889.....	88	210	298	1.31	3.13	4.44	2.35	5.61	7.96
1890.....	64	164	228	.86	2.21	3.08	1.69	4.32	6.02
1891.....	56	160	216	.79	2.20	2.10	1.48	4.22	5.69
1892.....	45	134	179	.56	1.69	2.25	1.18	3.50	4.68
1893.....	36	63	99	.47	.82	1.29	.93	1.63	2.57
1894.....	44	73	117	.64	1.05	1.69	1.13	1.88	3.01
1895.....	49	78	127	.71	1.12	1.83	1.25	1.99	3.25
Total....	747	1506	2253	.....	... ..	.....	.....	.....	.....
Average..	62	125	188	.91	1.82	2.66	1.66	3.35	5.02

In the above table, No. 56, the mortality from croup and diphtheria are combined for the years 1884 to 1895, inclusive. The total number of deaths for each year, together with the percentage to deaths from all causes and the death-rate to each 10,000 of the living, is shown for each disease.

TYPHOID FEVER.

TABLE No. 57.

Mortality from Typhoid Fever from 1884 *to* 1895, *inclusive.*

YEARS.	Deaths.	Percentages of deaths to deaths from all causes.	Death-rates per 10,000 living (estimated population).
1884	137	2.21	3.81
1885	136	2.19	3.75
1886	194	3.01	5.31
1887	134	2.06	3.64
1888	150	2.18	4.04
1889	161	2.40	4.30
1890	143	1.94	3.79
1891	170	2.42	4.48
1892	109	1.36	2.85
1893	121	1.58	3.14
1894	135	1.95	3.47
1895	99	1.43	2.53
Total	1,689	.....	.....
Average	141	2.06	3.76

Table No. 57 shows the number of deaths from typhoid fever for the past twelve years, together with the rate to deaths from all causes and to each 10,000 of the living population. It will be seen by this table that for the past year, 1895, the returns show a smaller number of deaths from this disease than ever before reported, to wit: 99. That the death-rate from this

disease is very much less than it was, say twenty years ago, is well known by practising physicians who have been engaged in the profession for that number of years or longer. The diminished mortality from typhoid fever is due to sanitary work and sanitary knowledge, without doubt, and it is only reasonable to believe that it may be still further reduced in the near future.

TABLE No. 58.

Mortality from Typhoid Fever from 1884 *to* 1895, *inclusive, by Ages.*

YEARS.	Under 1 year.	1 to 5.	5 to 10.	10 to 15.	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	Over 80.	Unknown.	Total.
1884.....	5	10	7	11	21	34	12	8	7	8	8	3	3	137
1885.....	2	7	7	11	20	34	14	8	7	10	11	3	2	136
1886.....	2	6	15	12	33	51	16	12	15	14	16	2	...	194
1887.....	2	6	1	16	22	41	17	8	7	6	5	2	1	138
1888.....	3	13	4	11	26	39	12	8	8	9	8	3	6	150
1889.....	4	5	9	14	26	50	13	14	10	5	6	4	1	161
1890.....	1	3	10	11	24	33	18	14	10	7	7	3	2	143
1891.....	1	3	14	12	27	52	17	15	8	9	8	3	1	170
1892.....	1	6	4	10	17	24	18	8	5	6	3	4	3	109
1893.....	1	8	3	9	23	29	22	10	5	5	3	1	2	121
1894.....	...	8	5	6	18	39	19	11	9	10	8	2	...	135
1895.....	1	2	2	7	19	28	10	12	4	7	3	1	3	99

The mortality from typhoid fever for the period given is shown by ages in Table No. 58. It will be seen by this table that no period of life is exempt from the disease, although the fatality is relatively much lighter in the first years of life.

KIDNEY DISEASES.

TABLE No. 59.

Mortality from Bright's Disease, Nephritis, and other Kidney Diseases, and from Dropsy, with Ratios to Total Mortality, from 1884 *to* 1895, *inclusive.*

YEARS.	Total mortality from all causes.	Deaths from Bright's disease, nephritis, and other kidney diseases.	Ratio to total mortality per 1,000.	Deaths from dropsy.	Ratio to total mortality per 1,000.	Totals.	Ratio to total mortality per 1,000.
1884	6,194	140	22.60	80	12.91	220	35.51
1885	6,201	157	25.32	90	14.51	247	39.83
1886	6,426	143	22.25	83	12.92	226	35.17
1887	6,479	163	25.16	79	12.19	242	37.35
1888	6,854	154	22.47	75	10.94	229	33.41
1889	6,696	200	29.87	62	9.26	262	39.13
1890	7,368	201	27.28	53	7.19	254	34.47
1891	7,310	219	29.96	41	5.61	260	35.57
1892	7,988	222	27.99	43	5.38	265	33.17
1893	7,663	194	25.32	49	6.39	243	31.71
1894	6,898	186	26.96	42	6.09	228	33.05
1895	6,929	225	32.47	35	5.05	260	37.52

Table No. 59 exhibits the mortality from kidney diseases for twelve years, 1884 to 1895, inclusive, including Bright's disease, nephritis, other kidney diseases and "dropsy." The latter term is in reality a misnomer, and its classification as a special disease will probably not be maintained after a revision of the causes of death is made. It will be seen that the annual mortality from these causes is large, and that it does not vary materially from year to year. In the year 1895 there were 225 deaths from Bright's and other kidney diseases.

SCARLET FEVER.

TABLE No. 60.

Mortality from Scarlatina from 1884 *to* 1895, *inclusive.*

YEARS.	Deaths.	Percentages of deaths to deaths from all causes.	Death-rates per 10,000 living population.*
1884	52	.83	1.44
1885	53	.85	1.46
1886	21	.32	.57
1887	26	.40	.70
1888	34	.49	.91
1889	18	.26	.48
1890	16	.21	.42
1891	13	.18	.34
1892	27	.33	.71
1893	52	.67	1.35
1894	61	.88	1.57
1895	58	.83	1.48
Total	431	.....	.....
Average	36	.52	.95

* Population estimated for all but census years.

Table No. 60 embraces a statement of the number of deaths from scarlet fever for twelve years, 1884 to 1895, inclusive, together with percentages to deaths from all causes and to each 10,000 of the living population. It will be seen that there was a relatively lower mortality from this disease from 1885 to 1893, and from the latter year to 1895, a considerable increase in the death-rate, although in the latter year there was a slight falling off in the number.

MEASLES.

TABLE No. 61.

Mortality from Measles from 1884 *to* 1895, *inclusive.*

YEARS.	Deaths.	Percentages of deaths to deaths from all causes.	Death-rate per 10,000 living population.*
1884	3	.04	.08
1885	45	.72	1.24
1886	18	.28	.49
1887	39	.60	1.06
1888	55	.80	1.48
1889	16	.23	.42
1890	9	.12	.23
1891	19	.26	.50
1892	24	.30	.62
1893	32	.41	.83
1894	14	.20	.36
1895	7	.10	.18
Total	281	.....	.....
Average	23	.34	.62

* Population estimated for all but census years.

Table No. 61 shows the number of deaths from measles from 1884 to 1895, inclusive. It will be noted that the mortality from this disease varies greatly from year to year. In 1895 there were only seven deaths returned from this cause, while for the year previous there were fourteen.

INDEX.

PAGE

Abbott, Dr. S. W., on the bacteriological examination of milk..... 78
relation of state and local boards of health to each other and to the people 90
Address before the New Hampshire Association of Boards of Health, by Granville P. Conn, M. D..... 44
Allenstown, report on the water-supply of..... 4
Amherst, report on the water-supply of..... 4
Andover, report on the water-supply of..... 4
Antrim, report on the water-supply of..... 6
A Plea for Sanitary Marriage and Home, by C. W. Downing, M. D..... 102
Ashland, report on the water-supply of 7

Baker, W. D., remarks on fumigation with sulphur..... 89
Bath, report on the water-supply of..... 8
Belmont, report on the water-supply of..... 8
Bennington, report on the water-supply of..... 9
Berlin, report on the water-supply of 10
Bethlehem, report on the water-supply of.. 10
Births, American and foreign, 1894, 1895 191
in cities, 1894, 1895..... 190
marriages and deaths..... 189
Boards of health..... vii
local and state, relations of, to each other and to the people..... 90
some of the rights and duties of..... 114
Boards of Health and Health Officers, New Hampshire Association of.....ix, 41
constitution of..... 123
officers of..... 122
Boscawen, report on the water-supply of..... 11
Bovine tuberculosis, prevention of 137
Bowditch, Ernest W., Notes on the Sewerage for the City of Rochester.... 127
Brain diseases, deaths from, 1884 to 1895..... 221
Bristol, report on the water-supply of..... 11

Canaan, report on the water-supply of..... 12
Cancer, mortality from, 1884 to 1895 224
Candia, report on the water-supply of..... 12
Cattle commissioners, the board of..... x
report of 135
Cholera infantum, deaths from, 1884 to 1895..... 223
Claremont, report on the water-supply of..... 12
Clough, Herbert S., The Authority of the Health Officer not Sufficient in some Cases..... 79
discussion on Impediments to Sanitation..... 59

Colebrook, report on the water-supply of 13
Collins, Dr. C. S., Words Wise or Otherwise upon Modern Sanitation 69
Committee on the Cause and Prevention of Diphtheria, report of 172
Concord, report on the water-supply of 14
Consumption, deaths from, 1884 to 1895 208
in 1894, in Concord 210
1895, in Concord 210
1894, in Dover 213
1895, in Dover 213
1894, in Franklin 218
1895, in Franklin 218
1894, in Keene 214
1895, in Keene 214
1894, in Laconia 216
1895, in Laconia 216
1894, in Nashua 211
1895, in Nashua 211
1894, in Manchester 209
1895, in Manchester 209
1894, in Portsmouth 212
1895, in Portsmouth 212
1894, in Rochester 215
1895, in Rochester 215
1894, in Somersworth 217
1895, in Somersworth 217
Constitutional diseases, deaths from, 1884 to 1895 204
Conway, report on the water-supply of 16
Conn, Dr. Granville P., address before the New Hampshire Association of Boards of Health 44
Cook, Dr. George, discussion on Impediments to Sanitation 52
Croup 227
deaths from, 1884 to 1895, by ages 226
Currier, Dr. D. M., Impediments to Sanitation 47

Deaths in 1894, by age periods, compared with the living population at each period 200
by seasons 202
of children under five years of age, by seasons 201
Deaths in 1895, by age periods, compared with the living population at each period 200
by seasons 202
of children under five years of age, by seasons 201
in 1894 and 1895, from consumption, in the cities of the state 209-219
from 1883 to 1895, at age periods 199
and death-rates, 1884 to 1895 197
1884 to 1895, causes of, twenty prominent 207
number of male and female decedents compared 198
from brain diseases 221
cancer 224
cholera infantum 223
constitutional diseases 204
consumption 208
croup, by ages 226
developmental diseases 206
diarrhœal diseases 222
diphtheria, by ages 225
kidney diseases 230

local diseases 205
measles 232
pneumonia, by counties 219
by months and quarters 220
scarlet fever 231
typhoid fever 228
by ages 229
zymotic diseases 203
Derry, report on the water-supply of 16
Developmental diseases, deaths from, 1884 to 1895 206
Diarrhœal diseases, deaths from, 1884 to 1895 222
Diphtheria 227
deaths from, 1884 to 1895, by ages 225
Diseases, infantile, the prevention of 109
Disinfection—Formic Aldehyde Gas, by Irving A. Watson, M. D. 82
Divorces, 1870–'95, by counties 195
ratio of, to marriages, 1882 to 1895 196
Downing, Dr. C. W., A Plea for a Sanitary Marriage and Home 102

Eaton, report on the water-supply of 17
Enfield, report on the water-supply of 17
Epidemics vi
Exeter, report on the water-supply of 17

Fever, typhoid, deaths from, 1884 to 1895 228
by ages 229
Formic aldehyde gas as a disinfectant 82
Francestown, report on the water-supply of 18
Franconia, report on the water-supply of 18
Franklin, report on the water-supply of 19

Gilsum, report on the water-supply of 19
Goffstown, report on the water-supply of 20
Gorham, report on the water-supply of 20
Greeley, Dr. James T., discussion on Impediments to Sanitation 62
Sanitation 74
on the bacteriological examination of milk 80
Groveton (Northumberland), report on the water-supply of 21

Hancock, report on the water-supply of 22
Hanover, report on the water-supply of 22
Haverhill, report on the water-supply of 23
Henniker, report on the water-supply of 24
Hillsborough, report on the water-supply of 25
Holcombe, Dr., remarks 89
Hooksett, report on the water-supply of 25
Hopkinton, report on the water-supply of 26
Houghton, Dr. E. F discussion on Impediments to Sanitation 65
Hudson, report on the water-supply of 26

Impediments to Sanitation, by D. M. Currier, M. D 47
Institutions, Charitable and Penal xi

Kennedy, Dr. J. F., The Composition and Infectiousness of Milk 150
Kidney diseases, deaths from, 1884 to 1895 230
Kinyoun, Dr. J. J., Report of the Committee on the Cause and Prevention of Diphtheria 172

Lancaster, report on the water-supply of 27
Lebanon, report on the water-supply of 27
Lincoln, report on the water-supply of 28
Littleton, report on the water-supply of 28
Local diseases, deaths from, 1884 to 1895 205
Lunacy, Commissioners of xi
Lyme, report on the water-supply of 28

Manchester, report on the water-supply of 29
Marriage and home, a plea for a sanitary 102
Marriages, 1882 to 1895 192
according to nativity, 1882 to 1895 193
for twelve years, 1883 to 1895 193
proportion of American to foreign-born persons married 194
Measles, deaths from, 1884 to 1895 232
Meriden, report on the water-supply of 30
Milford, report on the water-supply of 30
Milk, bacteriological examination of 74, 78, 80
composition and infectiousness of 150
Morrison, Mr., discussion on Impediments to Sanitation 62

Nashua, report on the water-supply of 31
New Hampshire Association of Boards of Health and Health Officers 41
Newmarket, report on the water-supply of 31
Newport, report on the water-supply of 32
Northfield, report on the water-supply of 33
North Haverhill, report on the water-supply of 23
Notes on the sewerage for the city of Rochester, N. H., by Ernest W. Bowditch, C. E., Boston, Mass 127

Officers of the Association of Boards of Health and Health Officers 122
On the Relation of State and Local Boards of Health to Each Other and to the People, by Samuel W. Abbott, M. D 90

Pembroke, report on the water-supply of 33
Peterborough, report on the water-supply of 33
Pittsfield, report on the water-supply of 34
Plymouth, report on the water-supply of 35
Pneumonia, deaths from, 1884 to 1895, by counties 219
by months and quarters 220
Population by counties, 1880, 1890 187
of the state for each year 188
Portsmouth, report on the water-supply of 35

Quarantine 143

Raymond, report on the water-supply of 35
Report of the Committee on the Cause and Prevention of Diphtheria, by Dr. J. J. Kinyoun, chairman 172
Report upon some of the water-supplies of New Hampshire 1
Robbins, W. K., discussion on Impediments to Sanitation 57
Rochester, N. H., notes on the Sewerage for the City of 127
report on the water-supply of 36
Rockingham County Jail xiii
Rogers, Dr. Tristram, discussion on Impediments to Sanitation 65
Rollinsford, report on the water-supply of 36

S/

Sanders, Dr. W. R., discussion on Impediments to Sanitation 55
Sanitary Progress v
Scarlatina, deaths from, 1884 to 1895 231
Sewerage for the city of Rochester, N. H., construction of 128
notes on 127
Some of the Rights and Duties of Local Boards of Health, by Irving A. Watson, M. D 114
Somersworth, report on the water-supply of 37
Spofford, Mr., discussion on Impediments to Sanitation 81
Sullivan, Dr. D. E., The Prevention of Infantile Diseases 109
Sunapee, report on the water-supply of 37

The Composition and Infectiousness of Milk, by J. F. Kennedy, A. M., M. D. 150
The Prevention of Infantile Diseases, by D. E. Sullivan, M. D 109
Tuberculosis vii
Bovine 137

Vital statistics ix
summary of 187

Warner, report on the water-supply of 37
Water-supplies of New Hampshire, report upon some of the 1
Water-supply, report on the, of Allenstown 4
Amherst 4
Andover 4
Antrim 6
Ashland 7
Bath 8
Belmont 8
Bennington 9
Berlin 10
Bethlehem 10
Boscawen 11
Bristol 11
Canaan 12
Candia 12
Claremont 12
Colebrook 13
Concord 14
Conway 16
Derry 16
Eaton 17
Enfield 17
Exeter 17
Francestown 18
Franconia 18
Franklin 19
Gilsum 19
Goffstown 20
Gorham 20
Groveton (Northumberland) 21
Hancock 22
Hanover 22
Haverhill 23
North Haverhill 23
Henniker 24
Hillsborough 25

Water-supply, report on the, of Hooksett 25
Hopkinton 26
Hudson 26
Lancaster 27
Lebanon 27
Lincoln 28
Littleton 28
Lyme 28
Manchester 29
Meriden 30
Milford 30
Nashua 31
Newmarket 31
Newport 32
Northfield 33
Pembroke 33
Peterborough 33
Pittsfield 34
Portsmouth 34
Plymouth 35
Raymond 35
Rochester 36
Rollinsford 36
Somersworth 37
Sunapee 37
Warner 37
Whitefield 38
Wolfeborough 38
Woodstock (North) 39
Woodsville 24
Water-supplies, public ix
Watson, Dr. Irving A., discussion on Impediments to Sanitation 59
Disinfection—Formic aldehyde gas 82
Some of the Rights and Duties of Local Boards of Health 114
Whitefield, report on the water-supply of 38
Wolfeborough, report on the water-supply of 38
Woodstock (North), report on the water-supply of 39
Woodsville, report on the water-supply of 24
Words Wise or Otherwise upon Modern Sanitation, by C. S. Collins, M. D. .. 69

Zymotic diseases, deaths from, 1884 to 1895 203

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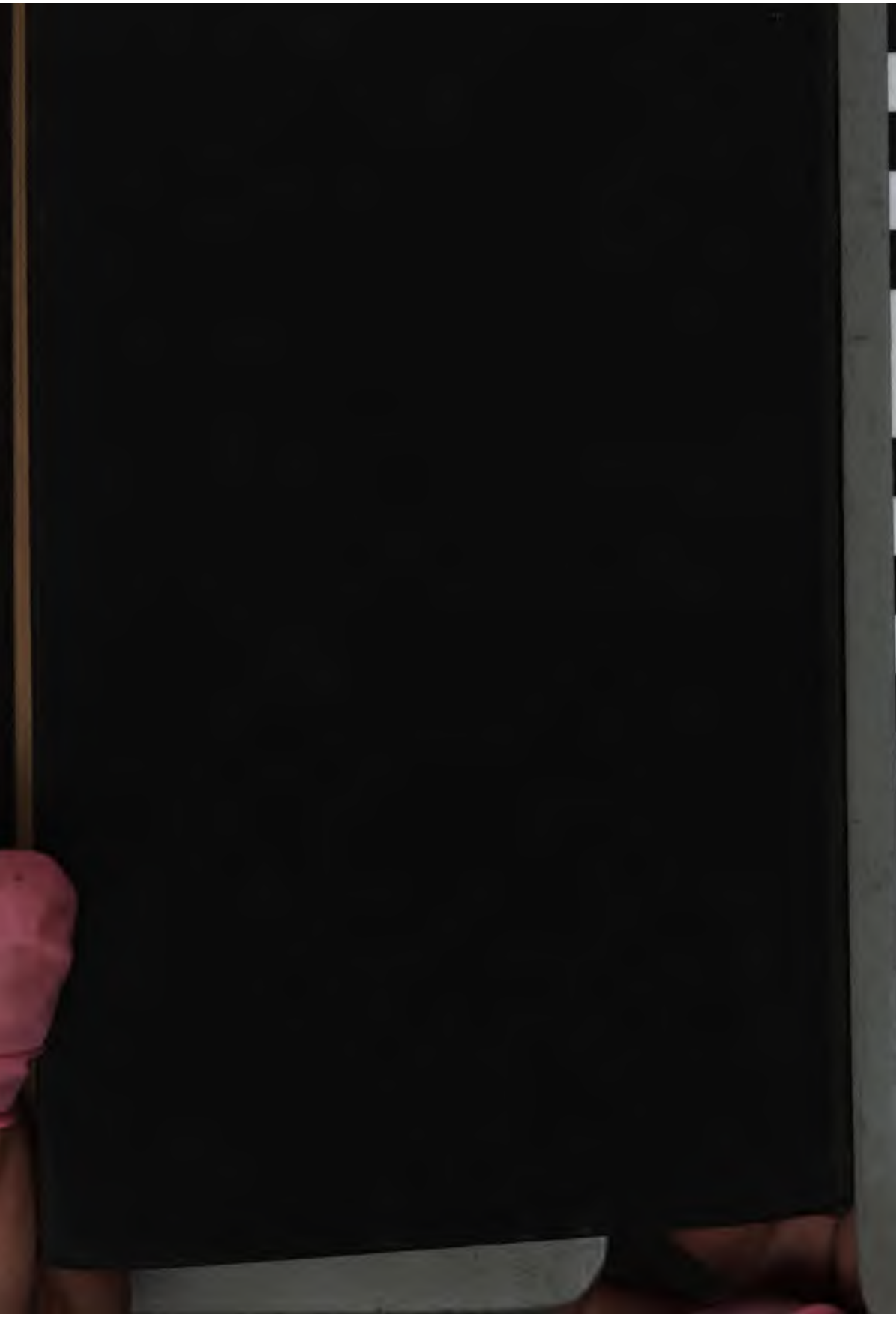
1895/96

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